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JANUARY TO JUNE

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Journal of Electricity

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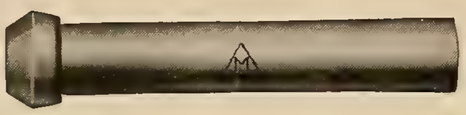
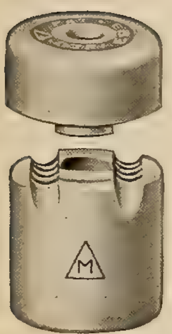
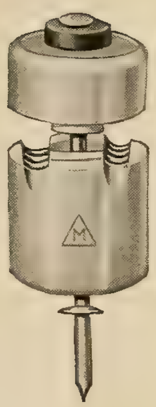
Journal of Electricity

Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES







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Happy New Year

ANOTHER milestone on the road of life has been passed, and the season of the year has come when all good men and true view in retrospect the year that has gone and turn with renewed vigor to the prospect that is in store.

The Chinese, so we are told, pay their debts that they may wear in their hats the little red button signifying a clear financial conscience. The American prepares his annual reports for his stockholders, and his budget for the new year, while socially the cheer of the smiling countenance and the "Happy New Year" greeting proclaims a renewal of the promise of "On Earth, Peace, Good Will to Men."

There is not a cloud upon the electrical horizon. The working of the Dawes reparation plan brings promise of financial recovery to stricken Europe. The presidential election of last fall has stilled for the present the anti-social menace of the apostles of unrest. In California and Washington, the Water and Power Act and the Bone "Free" Power Bill have been relegated to the limbo of forgotten things. And even Jupiter Pluvius has smiled, or, rather, wept copiously, upon the entire West, bringing promise of an abundance of hydro-kilowatts to the electrical industry and bounteous crops to the farmer.

A Happy New Year to all, and with it a prayer of thanksgiving for the benefits we have received at His hands.

EDITORIAL

Book Profits and Bank Balance

FIGURES of earnings that are interesting, to say the least, are disclosed in the latest report disseminated by the Los Angeles Bureau of Power and Light. It seems that, according to the report, gross earnings for the fiscal year ended June 30, 1924, were $9,302,092, and that the net for the same period was $3,051,306.45. This, a Los Angeles daily paper announces, is a "huge" profit.

True enough, it seems huge indeed, and even "huger," so to speak, when it is stated that the Bureau has returned surplus earnings totaling $9,474,510.21 since it entered the field of generating and distributing electrical energy. But, as Mother Goose would say, "Where's the pint of pickled peppers Peter Piper picked?"

The investment is given at $38,403,000, yet the interest payments for the year were only $1,041,000, while the taxpayers' investment in the aqueduct, the source of power supply, is mentioned not at all. Obviously, half the aqueduct cost should be charged to the Power Bureau investment account, increasing the invested capital in the power project to more than $53,000,000. Interest at 4½ per cent and a sinking fund charge of 2½ per cent annually for eventual retirement of bonds and capital would necessitate a yearly charge against earnings of $3,710,000 instead of $1,041,000. The difference, $2,669,000, should be charged to power cost and credited to the water users and taxpayers who are paying the fiddler.

It would seem thus that the "earnings" by any business-like method of computation would be reduced to $382,000, or about seven-tenths of 1 per cent on an investment of $53,000,000. Further, the exemption of this capital from all taxation places a burden upon the people of not less than $1,460,000, funds that must be provided to carry on the business of government.

We cannot do other than repeat, "Where's the pint of pickled peppers Peter Piper picked?"

Evil of the "Courtesy" Discount

AN old idea with a new name is spreading within the electrical industry. It is called the "courtesy" discount. It is not related to the Smiles movement or to the Courteous Service Club. On the contrary, it is not a producer of smiles, nor has it anything to do with courtesy. The discount is there, however, and that is exactly what it is, no more and no less.

A dealer in anything must make a living from the profit on what he sells. No profit, no living—that is self-evident. It is with the tricks and devices of some people who, wittingly or unwittingly, seek to take from the dealer his profit that this little discussion has to deal. There is the dealer who needs to be saved from his friends, the friends who take advantage of their personal or social relationship, and want to buy from the dealer such articles as they need at "cost"—that is, at cost to the dealer.

Then there are many other offenders of one class or another, who approach the jobber on some personal basis in order to buy from him an article at "dealer's" prices. All of these gentry are undoubtedly fundamentally honest—that is to say, they would not pick the dealer's pocket, even had they an opportunity to do so. Yet that is precisely what they are doing whenever they, collectively or individually, ask for a "courtesy" discount.

If the laborer is worthy of his hire, then the dealer is justly entitled to his profit, and a "friend," so called, should be the last rather than the first one to ask him to forego it. It is quite as unjust for a great organization to use its purchasing power and influence to buy things for its employees from a dealer at dealer's cost as it would be if the situation were reversed. The dealer does not want to be held up, but in most cases he is afraid to refuse. If those who seek favors would put themselves in the other fellow's place, this unfair practice would cease, and, in the meantime, a little stiffener applied to the spinal column of the dealer and the jobber might help.

Attendance at Trade Association Meetings

A CONTRACTOR-DEALER joined a trade association, paid his dues and for several months was one of the most active figures in the organization. Then his interest apparently waned. He skipped one meeting and finally stopped attending entirely. In the meantime the local department of electricity drafted a new ordinance which was discussed at several of the meetings of the association and finally passed with the approval of the membership. The ordinance had several radical changes in installation requirements incorporated in it, one of which was an extension of the area in which conduit was required.

The absent member remained in blissful ignorance of the new ordinance. During the course of his business dealings he was awarded a contract within the new conduit limits. His ignorance was

far from blissful when, after installing a high-class knob-and-tube job, an electrical inspector informed him that the wiring must be ripped out and the installation brought up to the requirements of the new ordinance. His loss was heavy, much more than enough to wipe out all of the slim profit he had figured on the original bid. Needless to say, since that unhappy experience he has been one of the most regular attendants at the meetings of his trade association. Moreover he is one of the strongest boosters for the association movement.

Why Not an Electrical Wedding Anniversary?

SOCIAL customs are difficult to change and even more difficult to establish, but a movement has been started which merits the consideration and support of the entire electrical industry. Directly as a result of the "June Bride" sales campaigns which have been staged by the industry during June of each year in many sections of the country, the suggestion has been made that one of the various wedding anniversaries be made an electrical anniversary, with domestic labor-saving appliances as remembrances of the occasion. The anniversary selected is the fourth, at present given over to fruit and flowers.

The remarks of Thomas A. Edison on this subject are interesting. In a letter to Charles L. Eidlitz of the Electrical Board of Trade of New York, Mr. Edison says: "Although I make no claim to be a social arbiter, there seems to be some good sound sense in making the fourth wedding anniversary an electrical one; that is to say, an opportunity for making electrical gifts. The young folks have then gotten over their early experiments in housekeeping and would undoubtedly appreciate the comfort and convenience afforded by the use of electrical devices in the household."

Electrical appliances have passed the stage of luxuries and are now classed among the necessaries for the home. There is no reason why this popular acceptance should not be capitalized in the manner suggested above. If, however, social customs are to be changed and electrical appliances listed along with "tin, woodenware, linen, silver and gold" on the anniversary calendar, the whole-hearted efforts of the entire industry must be given over to the task.

The Great Western-San Joaquin Merger

ONE of the most constructive events in the electrical industry of the West during the last several years is the recently consummated merger of the Great Western Power Company of California and the San Joaquin Light & Power Corporation and its associated companies. Not only does the consolidation of these two properties have a direct bearing upon the economic development of California and particularly the San Joaquin Valley, but the future plans which have been announced are of great importance to the light and power industry.

On another page of this issue, Guy C. Earl, president of the Great Western, discusses some of the economic aspects of the merger. Particular attention is directed to that part of Mr. Earl's article dealing with the 220,000-volt tie-line which is to be constructed from Sacramento to Merced. Although the present interconnected transmission system of the Pacific Coast surpasses anything in existence in the world tody, this new line will greatly facilitate the interchange of energy on account of its high voltage and high capacity.

With a 220,000-volt bus extending from the northern to the southern end of California, it is but a step to the further extension of this line from the Colorado River to the Canadian border.

The Future Of Radio

RADIO bids fair to become the giant of the electrical industry, at least in so far as universality of interest and distribution are concerned. In considering this newest, and in many ways most spectacular, application of electricity, one is apt to rhapsodize and indulge in all sorts of superlatives in contemplating what the future in radio may become. Really we have already the radio newspaper, the radio concert, the radio educational features, and also the radio propagandist as a feature in political campaigns. In this connection it is interesting to note that the prediction of Edward Bellamy in his "Looking Backward," published nearly fifty years ago, has been fulfilled.

The figures of the growth of radio are sufficiently striking in themselves. As one authority has expressed it, "In four short years, radio has grown from the scientific hobby of a few thousand 'bugs' to one of the major industries of the country." In 1902, about \$2,000,000 of radio apparatus was sold to the public. The year following, \$5,000,000 was sold. In 1922, the sales of radio apparatus reached the astounding figure of \$60,000,000. Then away went all records, with sales aggregating \$120,000,000 in 1923, and estimates for 1924 vary between \$240,000,000 and \$300,000,000.

Is this the end? We think not; in fact, it is probably merely the beginning of a development that will not cease until radio is just as much a part of every household as the electric light. It certainly has done more even than the telephone or the automobile to revolutionize rural life, while for the dweller in the remote places of the earth it is no less than a blessing. Electricity, indeed, is the world's greatest public servant.

The Way to the Top of the Ladder Is Open

WORD has been received of the appointment of three new directors of The Los Angeles Gas and Electric Corporation. They are Paul Overton, general counsel; T. P. McCrea, secretary, and Horace Cline, treasurer. News of this kind is always of unusual interest to the industry, especially since it signifies that three worthy gentlemen have advanced

by another rung farther up the ladder of success.

What is of even greater interest is the story of the steady advance, step by step, of these new directors. Mr. Cline's career with The Los Angeles Gas and Electric Corporation began in 1891, when he made his modest start as a bookkeeper for the Los Angeles Lighting Company. From that time to this his is a story of steady advancement through the many steps that have taken him now to the high position he occupies.

The story of Mr. McCrea is similar to that of Mr. Cline. He began as an accountant in 1893, while Mr. Overton, now general counsel and a director of the corporation, was once no more than a stenographer, in which position he made his modest start in 1904.

This is significant, not merely that these three men have made good, but that such things are not merely possible but probable in the industrial life of great corporations; in fact, this incident is of the very essence of America itself and the spirit of democracy. Here are no horizontal lines of cleavage separating forever our people into distinctive classes. The lines are vertical; the pathway to the top is always open to the man who has the will to do, and the habit of industry to carry him onward and upward.

Keep Smiling Through 1925

THE "Smiles" idea, originated by the Public Relations Committee of the Pacific Coast Electrical Association, seems to have taken the East by storm. Since the initial announcement concerning the Courteous Service Club first appeared, the committee in charge of the movement has been besieged with letters from all sections of the country asking for further information regarding the club. The letters have come from power companies, trade associations and manufacturers who recognize the value of public good will to their particular business and the importance of the attitude of their employees toward the public.

So appealing is the idea that Eastern newspapers have picked up excerpts of a recent article in Forbes Magazine describing the club. The following, taken from the Buffalo, N. Y., Commercial, is typical of a number which have been received:

> Thirty-one thousand men and women in California, composing the rank and file of the electrical industry, have been recruited into a unique organization popularly known as the "Smiles Club." They have subscribed to the doctrine that a smile will accomplish more than a frown—and, besides, it is easier.
>
> "Always with a smile" is their motto. They mean a real smile, not a smirk.
>
> The smile comes from a kindly heart and is the outward evidence of an inner courtesy.
>
> When things are running smoothly, these electrical folks smile. When trouble is brewing, they smile in spite of it and lessen its effect.
>
> The smile is like the balloon tire—it may not remove all the bumps, but it makes them less noticeable.

The interest of an industry which originated the club and successfully carried on a membership drive which netted more than 25,000 members must not be allowed to wane—especially when the movement has met with such a reception in other sections of the country. To members of the Courteous Service Club we say, "Wear your button, remember your pledge—SMILE."

The Interdependent Industry

EVERYTHING has to start somewhere, and that particular somewhere may be discovered if one can go back far enough, regardless of what it is that is under discussion. It may be said that the electrical industry began with the early carboniferous age, if one is considering steam with coal fuel as the prime mover. In the Western country electricity has its inception with the various meteorological phenomena that take substance in the form of rain and snow.

Be all these as they may, the electrical industry begins with the central station. It is the keystone in the arch, the hub of the wheel, as it were, from which the spokes typifying the other branches of the industry radiate, and all are bound together by the rim of interdependence and common interest.

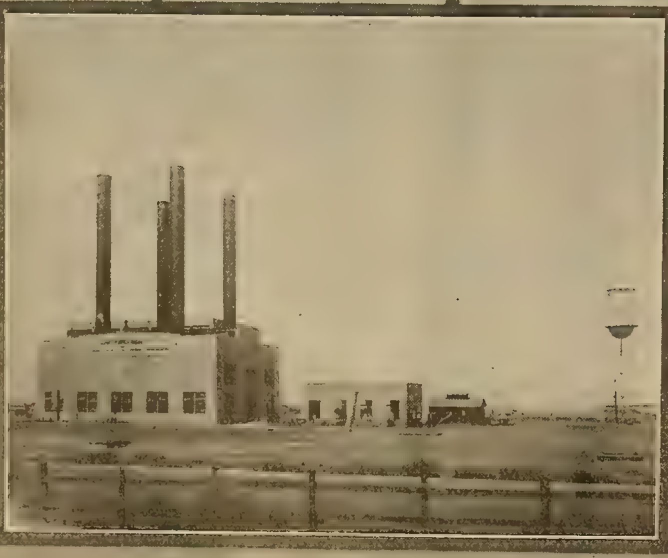
One might argue, of what use without kilowatts are the curling iron, toasters, washing machines and the countless other electrical servants that help to make the world a better place to live in for every one of us. On the other hand, there could be no kilowatts without the apparatus with which they are generated, so the manufacturer and the central station are the double hub of the electrical wheel, in the sense that each contributes equally to the creation of electrical energy.

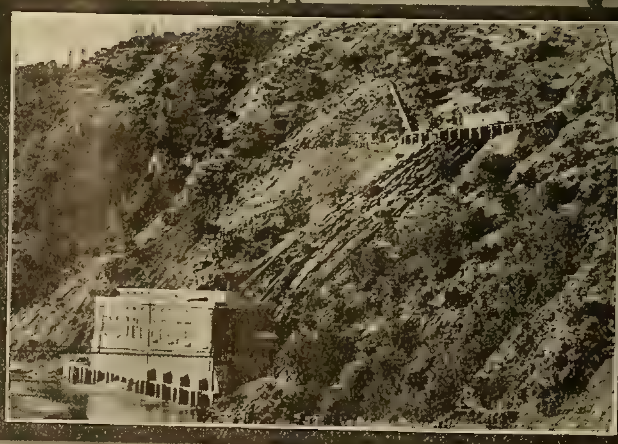
Nevertheless, the credit for initiating the development of electricity must be awarded to the central station. It represents the first step in the cycle of events, so about the central station as a nucleus clusters a group of specialized branches of the electrical industry, primarily dependent for their livelihood upon how good a job the central station does, and upon how energetically it prosecutes its program of development by which electrical service may be extended to every nook and cranny of the country. The degree to which electricity is utilized in the home as well as the factory may be taken as an index of happiness and prosperity. Electricity is more than a mere tool in the hands of industry; it is one of life's great civilizing agents.

Interconnection of electrical power lines is one of the great feats of Pacific Coast central stations, but greater than this physical union is the intangible but just as real interconnection of all branches of the industry, with the central station as the focal point.

The men of the electrical industry should view their work from the standpoint of the welfare of the industry as a whole, for the very practical reason that whatever injures, or helps, any one branch will affect all of the others correspondingly. It is one great family with a common interest, not a heterogeneous lot of disconnected, independent units.

THE merger of the properties of the Great Western Power Company of California and the San Joaquin Light & Power Corporation and its associated companies ties together two systems unique in many respects. The accompanying views show some of the outstanding developments of each company. Above is Big Meadows dam and Lake Almanor in Plumas County. The Great Western plans to raise this dam 45 ft. within the immediate future, giving a storage capacity of 1,300,000 acre-ft., roughly equivalent to the total storage of all water and power companies in the state today. At the left is the 42,600-kw. Kerckhoff plant of the San Joaquin company on the San Joaquin River. Below at the left is the Midway steam plant of the San Joaquin company in the Kern River oil fields. This plant has a capacity of 25,000 kw. and is unique in that natural gas is used for fuel. Las Plumas power house, capacity 65,000 kw., is shown below at the right. This plant is one of two on the North Fork of the Feather River, where the Great Western plans ultimately to develop 800,000 hp. in ten hydro plants.





Some Economic Aspects of the Great Western-San Joaquin Merger

By Guy C. Earl
President, Great Western Power Company of California

THE recently consummated merger of the Great Western Power Company of California and the San Joaquin Light & Power Corporation and its associated company, the Midland Counties Public Service Corporation, has an important bearing upon the economic life of California and upon the electric light and power industry of that state and the entire Pacific Coast. In this article Mr. Earl discusses some of the economic effects of the consolidation.

OF great importance to the economic life of California and one of the most constructive acts of the past several years for the upbuilding and development of the northern and central section of the state and the San Joaquin Valley is the recently consummated merger of the properties of the Great Western Power Company of California and the San Joaquin Light & Power Corporation. The consolidation has particular bearing on the electrical industry of California and the Pacific Coast because the high-tension lines of these two companies are susceptible of interconnection into a statewide system extending from northern to southern California. This system with the hydroelectric plants developed and to be developed and the immense facilities in use and in prospect for storing water marks an important step in the formation of a high-voltage, high-capacity bus which will greatly facilitate the interchange of energy between the lines of every electric power company on the Pacific Coast.

Briefly, the merger involves the properties of the Great Western Power Company in the northern and the San Joaquin Light & Power Corporation and the Midland Counties Public Service Corporation in the central and southern section of the state. The former company operates in fourteen counties having an area of 14,913 sq.mi. and a population of approximately 1,800,000. The latter two serve ten counties with an area of 34,945 sq.mi. and a population of 400,000. The combined assets of the two systems are approximately $167,500,000. The consolidated companies have 3,316 employees with an annual payroll of $4,995,087. The taxes paid in 1923 were $1,412,000. Other physical data on the systems are given in the accompanying tables, of which Table No. I shows the number and capacity of the generating plants, both steam and hydroelectric. Table No. II gives the miles of transmission and distribution lines operated. The number and kilowatt capacity of the substations are shown in Table No. III. Table IV shows the kilowatt-hour output of the generating plants. A classification of the number of consumers is contained in Table No. V, while Table No. VI shows the connected load by classes. The monthly system peaks for both the Great Western and the San Joaquin systems are shown in Table No. VII.

The character of the load on the two systems is clearly shown in this last table. Because of the irrigation load, the San Joaquin system is subject to a summer peak, which reaches the maximum in July and August. The Great Western Power Company, on account of its regular and marked growth, shows no characteristic monthly peak. With but few exceptions the peak for each month is slightly in excess of that of the preceding month. However, the character of the connected load of the Great Western is such that, were it not for the growth, the system would be subjected to a winter peak, due to the industrial and commercial power and the commercial lighting load. The economic effect of the consolidation of two systems of such widely different characteristics will be discussed later.

Plans evolved as a result of the merger contemplate raising, in the immediate future, the dam at

Table No. I—Generating Plants*

Steam Plants—	Number of Plants	Number of Units	Kw. Capacity
San Joaquin Light & Power Corporation	3	6	54,050
Midland Public Service Corporation	0	0	
Total San Joaquin System	3	6	54,050
Great Western Power Company	7	10	30,075
Total Steam Plants	10	16	84,125
Hydro Plants—			
San Joaquin Light & Power Corporation	11	21	86,600
Midland Public Service Corporation	0	0	
Total San Joaquin System	11	21	86,600
Great Western Power Company	2	8	109,000
Total hydro plants	13	29	195,600
Combined total	23	45	279,725

*Statistics in all tables as of Dec. 31, 1923.

Table No. II—Miles of Line

	San Joaquin Light & Power Corporation	Midland Public Service Corp.	Total San Joaquin System	Great Western Power Co.	Total Combined
Distribution (Overhead)	3,777.92	417.39	4,195.31	1,636.62	5,631.93
Distribution (Underground)	....	....	....	40.43	40.43
Total distribution	3,777.92	417.39	4,195.31	1,677.05	5,872.36
Transmission	1,245.45	176.59	1,422.04	375.90	1,797.94
Total lines	5,023.37	593.98	5,617.35	2,052.95	7,670.30

Lake Almanor, in Plumas County, 45 ft., giving a storage capacity of approximately 1,300,000 acre-ft., which is roughly equivalent to the total storage of all water and power companies in California today. These plans further provide for the immediate interconnection of the transmission systems of the two companies with a tie-line extending from Sacramento to Merced, a distance of approximately 105 miles. This tie-line will be constructed for an ultimate voltage of 220 kv., but will in all probability be operated initially at 165 kv., the present voltage of the Great Western transmission system from its Caribou plant to the San Francisco Bay region. Operating at 220 kv., this line will have a capacity of 120,000 kilowatts, which is approximately one-third greater than the present total maximum demand of the entire San Joaquin system.

Table No. III—Substations

	No.	Capacity (kw.)
San Joaquin Light & Power Corporation	50	143,820
Midland Counties Public Service Corporation	10	15,750
Great Western Power Company	48	177,475
Total		337,045

Table No. IV.—Kw-hr. Output by Generating Plants

	Thousands of kw-hr.
Hydro Output—	
San Joaquin Light & Power Corporation	406,524
Great Western Power Company	560,288
Steam Output—	
San Joaquin Light & Power Corporation	58,880
Great Western Power Company	14,995
Combined total of hydro and steam output	1,040,687

The merger has an important economic bearing upon the two companies individually, because interconnection of two systems such as those involved invariably works for the betterment of both. In a preceding paragraph the load characteristics of the individual systems were discussed. The combination of the two will give a better system load factor.

Table No. V—Number of Consumers' Meters by Classes

	San Joaquin Light & Power Corporation	Midland Public Service Corp.	Total San Joaquin System	Great Western Power System	Total Combined
Residence lighting	39,055	5,122	44,177	25,118	69,295
Commercial lighting	7,469	1,456	8,925	11,478	20,403
Lighting, heating, cooking	1,254	286	1,540	2,190	3,730
Heating and cooking	164	....	164	207	371
Municipal lighting	89	13	102	136	238
Other lighting	329	61	390	....	290
Industrial and commercial power	2,484	526	3,010	5,611	8,621
Oil (other power)	200	175	375	....	375
Agricultural power	5,483	122	5,605	1,920	7,525
Municipal power	126	34	160	30	190
Railway power	3	1	4	15	19
Resale—other electric corporations	2	1	3	19	22
Total	56,658	7,797	64,455	46,724	111,179

Since load factor is one of the most important factors entering into cost of service, it is obvious that the higher the load factor the lower the cost of production, and the public is in a position ultimately to benefit. Capacity factor—the ratio of the average load to the total installed capacity—in a like manner, has an important bearing on rates. The lower the margin of reserve capacity necessary to supply adequate service to a given territory, the lower the fixed charges on the investment necessary to serve.

Furthermore, consolidation will result in a reduction in the cost of engineering and superintendence. Additional economies will be possible on account of the combined purchasing power of the two companies. Because of the size and the greater stability and earning power of the consolidated system, it will be possible to secure money at lower rates.

Table No. VI—Connected Load by Classes of Consumers—Kw.

	San Joaquin Light & Power Corporation	Midland Public Service Corp.	Total San Joaquin System	Great Western Power System	Total Combined
Residence lighting	39,055	5,122	44,177	25,933	70,170
Commercial lighting	22,377	2,987	25,364	37,694	63,058
Lighting, heating, cooking	10,041	2,575	12,616	16,955	29,571
Heating and cooking	1,416	....	1,416	1,786	3,202
Municipal lighting	1,790	79	1,869	3,006	4,875
Other lighting	1,595	126	1,721	....	1,721
Industrial and commercial power	37,893	6,476	44,369	155,219	199,588
Oil (other power)	13,566	9,268	22,834	....	22,834
Agricultural power	48,649	1,608	50,257	23,012	73,269
Municipal power	1,872	644	2,516	1,763	4,279
Railway power	1,320	168	1,488	17,926	19,414
Resale—other electric corporations	16,696	150	16,846	28,116	44,962
Total	196,270	29,203	225,473	311,470	536,943

From the standpoint of the light and power industry of the state as a whole, interconnection of the two systems will have a marked economic effect. The Great Western hydroelectric properties on the North Fork of the Feather River combine in a remarkable way very heavy rainfall, a tremendous storage at an elevation of 4,500 ft., and the ultimate utilization of a drop from this elevation to the floor of the Sacramento Valley. Further, the North Fork and its tributaries rise in the lava country of Plumas and Lassen Counties, which is ideally suited for underground storage with resultant uniformity of flow. With the body of water which is proposed at Lake Almanor, collected in extremely wet years and carried into a dry cycle similar to that through which the state has just passed, the possibility of a

Table No. VII—System Peaks—Kw.

	San Joaquin Light & Power Corp. Exclusive of Wholesale service	Great Western Power Company Exclusive of Wholesale service	Total Combined Not Simultaneous
January	49,110	88,600	137,710
February	47,300	86,200	133,500
March	63,400	87,600	151,000
April	55,800	92,000	147,800
May	68,630	94,000	162,630
June	71,990	97,780	169,770
July	73,425	100,100	173,525
August	73,320	101,700	175,020
September	67,330	101,860	169,190
October	55,130	104,920	160,050
November	53,230	105,100	158,330
December	54,225	105,800	160,025

water shortage on the Great Western system will be practically eliminated. By means of the tie-line which will be constructed and by interconnections with other companies, the power produced on the Feather River will be made available throughout the entire state. Ultimately at least 800,000 hp. will be developed in ten plants on this stream. A conservative estimate of the total potential hydroelectric power available on the two systems is 1,500,000 hp.

The 220-kv. tie-line and the great storage capacity of Lake Almanor will practically preclude the possibility of any future power shortages in the state. Had such a tie-line been in existence during the present year, a considerable block of power could have been delivered from the Feather River plants to southern California over the San Joaquin system.

Something has already been said about the high-voltage high-capacity bus which will be established through the center of the state by the construction of the proposed tie-line. This line will handle great blocks of "wash" power; that is, power not needed in one section but easily salable in another section. The line would act much the same as a pipe line between two reservoirs. When demand exceeds supply in one section, power will flow in one direction, and vice versa. Not only does this apply to the San Joaquin and Great Western systems, but to the other companies of the state as well. Two hundred and twenty thousand-volt transmission is already being successfully employed in this state, and, with the construction of a line tying together the systems which are operating at this voltage, a trunk transmission bus extending from one end of the state to the other will become a reality. Too much has been written on the subject of interconnection and its benefits to repeat the economic benefits to be derived by the people of the state from such a line. However, it will permit the most economical operation of the plants on the systems to supply the existing load and a greater diversity in the use of production and transmission equipment.

The two properties affected by the merger are ideally supplementary. By their consolidation and interconnection and the unified operation it is expected that substantial savings will be accomplished. The merger is a step in the progress and development of the state as a whole and of the industry upon which this progress is dependent, and particularly will it be a great boon to the empire of the San Joaquin.

Power Company Has Model Electrical Garage

MANY a power company whose new-business department advocates the most modern of electrical installations to prospective industrial consumers is guilty of the roughest type of electrical work on its own premises. Its employees are presumed to be sufficiently familiar with their own work to be able to handle less than standard material without danger.

The San Joaquin Light & Power Corporation, on the other hand, in the company garage has carried out a model lighting and power installation on the theory not only that it will give better service to the company, but also that it will serve as an example and an inspiration to industrial plants and garages in that territory. The layout is complete in all respects, and the highest type of wiring and of switchboard connections is used throughout. All processes are electrified, remote control is used on all machines, and modern safety devices are installed where applicable. All wiring is in conduit.

At the present time over 100 cars are stored in the garage, and from 100 to 125 more are brought in regularly for repairs. This arrangement insures the maintenance of cars under standard conditions which can be carefully supervised by the company. With the cars all grouped at one place, they can be regularly checked in and out and inspected at frequent intervals. They are filled each night by the garage attendants without delaying the driver during the process. Paint and upholstery shops are included in the equipment of the plant, and repairs can be readily taken care of without the delay of sending the car out. The item of reduced insurance and the greater safety afforded valuable company equipment are not the least of the advantages derived from these facilities.

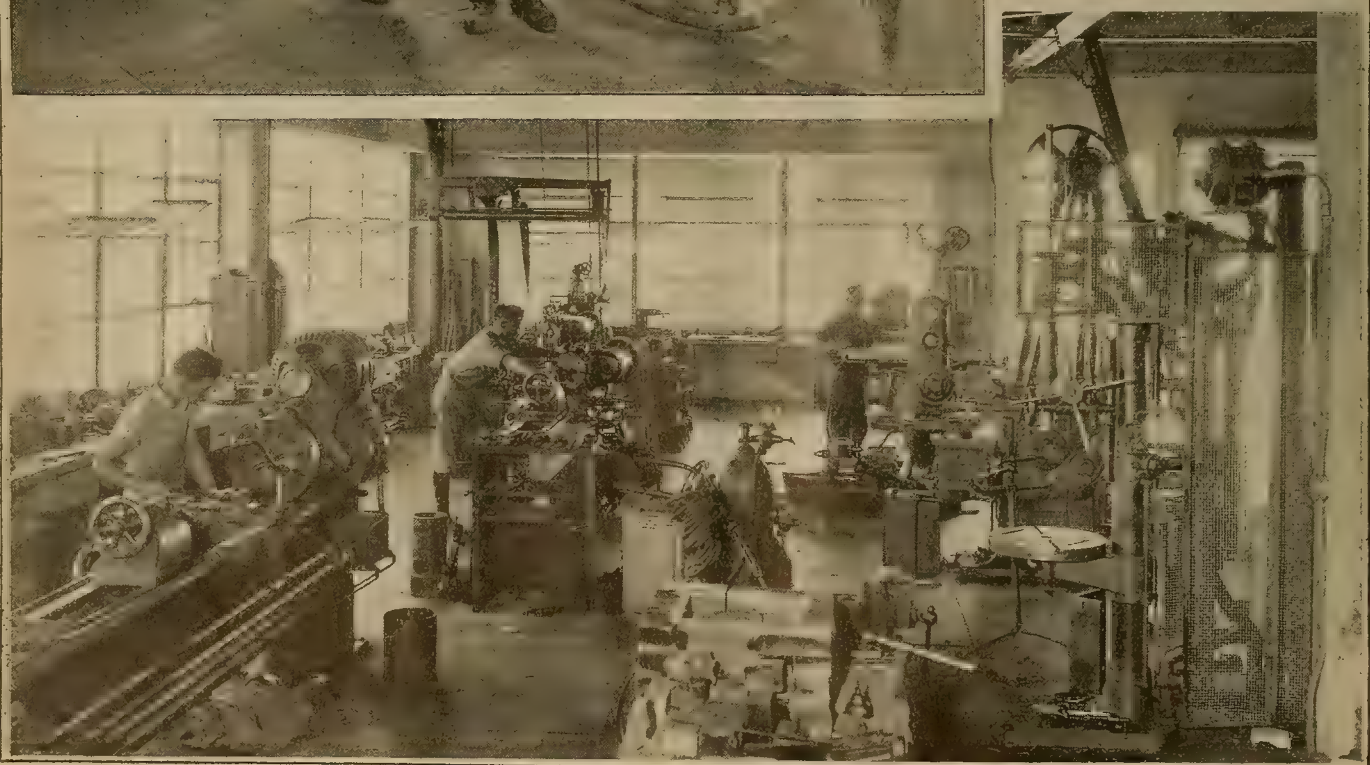
The motor installation is as follows:

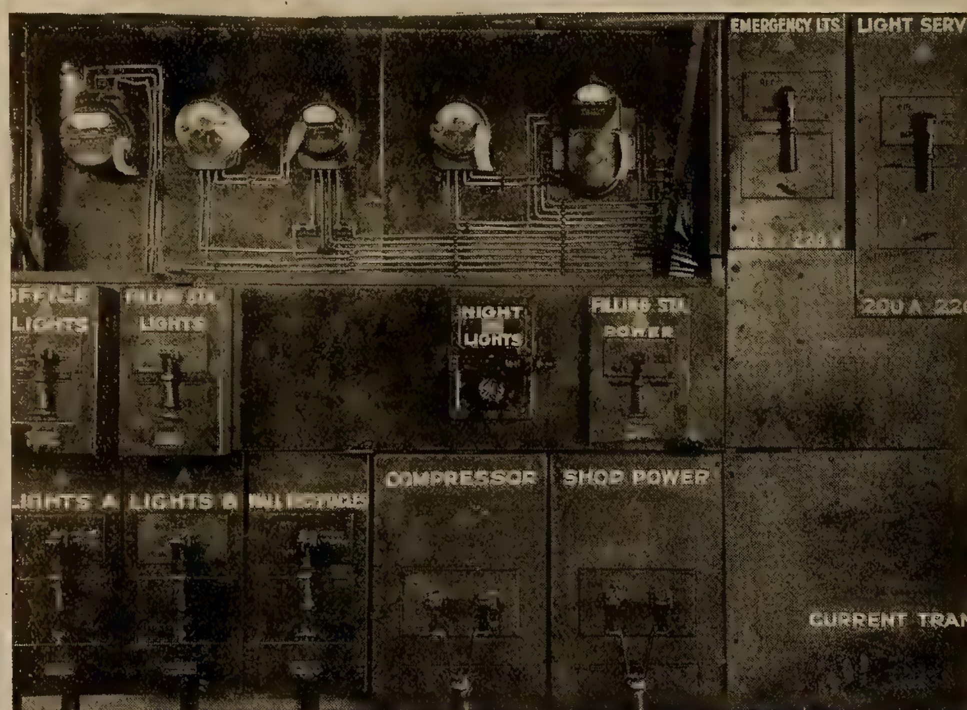
Machine Shop—	
Bandsaw	7.5 hp.
Hacksaw	0.5 hp.
Grinder	2.0 hp.
Drill press	2.0 hp.
Sensitive drill	1.0 hp.
Shaper	2.0 hp.
Grinder	0.5 hp.
Milling machine	3.0 hp.
Cylinder grinder	5.0 hp.
Universal grinder	3.0 hp.
14-in. lathe	2.0 hp.
18-in. lathe	5.0 hp.
18-in. lathe	3.0 hp.
12-in. lathe	2.0 hp.
Threading machine	3.0 hp.
Threading machine	3.0 hp.
Drill press	3.0 hp.
Punch	5.0 hp.
Grinder	3.0 hp.
Air compressor	30.0 hp.
Garage—	
Bearing burning-in	10.0 hp.
Bearing burning-in	20.0 hp.
Filling Station—	
Gasoline pump	2.0 hp.

Above—The building is constructed to house from 200 to 300 cars as well as the general machine shops and forge for all company purposes.

Center — An electric pump cares for the filling of machines. This can generally be done at night, occasioning no delay on the part of the driver.

Lower — Main machine shop. All machines are electrically operated with remote control, as well as the latest guards and safety devices.





Above—The forge in the new San Joaquin garage. All of the heavier machine work can be handled with the facilities in this shop.

Center—An idea of the character and size of the installation is to be gained from the view of the main switch board.

Lower—The main working room of the garage where repair work is done. Note the neat appearance of wiring and lighting arrangements.

The lighting load of the building amounts to 25,900 watts, power consumption for this service alone amounting to 8,000 kw-hr. for the winter months and to about 3,500 kw-hr. for the summer. Motors amounting in all to 117.5 hp. are installed in the machine shop, garage proper and filling station and average 4,000 kw-hr. per month in power consumption. Heating is provided by 1,800-watt heaters during the winter months.

Much interest has been shown in this installation by industrial plants and others contemplating the electrification of their equipment. The exterior of the building is well designed and calculated to attract favorable attention in itself. At one end the sign with a large colored reproduction of the company's trademark attractively announces the ownership of the building. In carrying out this installation, the company has had in mind the value of consistency in its effect on the mind of the possible future customer. The same argument which urges that the man who sells an electric range should use one in his own home holds good in the matter of wiring and garage equipment. The present model building of the San Joaquin corporation is evidence that it believes in the story that it preaches, which is "Electrify!"

New Record Established in Sale of Kitchen Lighting Units

By M. L. Cummings, Jr.
Utah Power & Light Company, Salt Lake City, Utah

A REMARKABLE achievement in electrical merchandising was the result of the "Daylight Your Kitchen" campaign conducted by the Utah Power & Light Company during the month of September, 1924. A total of 11,449 kitchen lighting units was sold by that company during the month, establishing what is considered a new record for the entire country.

Campaign plans, which had been carefully prepared before the opening gun was fired, included an effective series of newspaper advertisements, window displays and interior displays in the company's various stores and a number of special advertising features. One of the chief factors, however, in the success of the campaign was the spirit of enthusiasm shown by hundreds of the company's employees who participated. The employees were paid a commission of $1 for each unit sold, with the result that members of practically all departments of the organization were eager to test their ability as salesmen, and many of them received substantial checks for their efforts. A member of the general accounting department, for instance, during the first evening he attempted to sell took nine orders as a result of calling on ten people, and while his total for the month did not maintain that proportion he made an excellent showing. A street-car motorman, filled to the brim with "pep" and enthusiasm, sold more than 200 units during his spare time. There were many other instances of "high powered" selling by employees who never before had attempted that line of work.

A quota of 6,000 units was established at the beginning of the campaign, apportioned among the company's nine divisions. Early in the month, however, several divisions had exceeded their quota, and by the end of the month all of them except one were far ahead of it.

Cash prizes were awarded to the division which

Better working conditions in the kitchen were stressed in some of the advertisements run in the newspapers during the lighting unit campaign.

first reached its quota and to the division which exceeded its quota by the greatest percentage. Individual prizes were also awarded to employees making the greatest number of sales, and in some divisions weekly cash prizes were awarded on this basis.

Frequent sales meetings were held throughout the territory, and sales bulletins were issued by the general sales department. These bulletins showed the results of each day's sales and the standing of each division in relation to its quota, and were filled with "peppy" paragraphs covering the activities of the campaign. The offering of prizes and the pub-

Better light prevents groping for dishes in the shadows and thus prevents many accidents. Other advertisements called attention to the fact that adequate illumination prevented the misreading of labels on spices.

lishing of these bulletins developed and stimulated a high spirit of rivalry among divisions and individuals that was instrumental, to a considerable degree, in accomplishing the results obtained.

When it is realized that the Utah Power & Light Company serves a population of 360,000, which, comparatively speaking, is not large, and covers a rather widely scattered territory, some idea may be gained as to the intensity of sales effort and the amount of

The woman's pride in her kitchen was appealed to in this advertisement.

enthusiasm and cooperation among employees necessary for the success of such a campaign. These factors, backed by adequate and effective advertising and publicity, furnish the answer as to why this campaign was the most successful ever attempted.

The success of the campaign, however, was not alone due to the intensive effort of the employees but was also partly attributable to the fact that the consumers recognized the fact that the company was performing a useful economic service. The company's interest in improving home conditions carried weight with prospective buyers and created a favorable impression that bids fair to be lasting. It is expected that this sales campaign has done much to react favorably in the matter of public relations and it has, besides, added considerable attractive business to system load.

Taking Electricity to California Farms and Farm Homes

By J. P. Fairbank
Extension Specialist in Agricultural Engineering, University of California

BETTER lighting in California farm homes, 90,000 of which have electric service, is the aim of the Agricultural Engineering Division of the University of California which is using a portable exhibit to show proper home illumination. The exhibit at present is devoted to the kitchen, but the lecture given at the time of presentation before farm groups deals with better lighting in general.

REALIZING that there are 90,000 electrical consumers in California residing outside of the cities and towns of the state, the Division of Agricultural Engineering of the University of California last year decided that there was a vital need for an educational campaign to stimulate the intelligent use of electricity. The idea appealed to the Agricultural Extension service of the university, and the question was raised as to the practical thing to do.

Over a period of about four years the Division of Agricultural Engineering had been conducting various types of schools, to which the farmers of the community were invited. These schools, varying in duration from one week to one day, were conducted in various parts of the state in order that men from various localities might participate in them. The schools covered such things as tractor maintenance, orchard spraying, rural sanitation and electric wiring. In the wiring schools electric wiring in accordance with underwriters' and state safety codes was shown and explained.

Through these wiring schools and talks on common electrical subjects, at Farm Center meetings, electrical information was being taken to an occasional community. A few meetings were held in which women were told how to make simple repairs to electrical appliances. This sporadic work developed the fact that the farmers and farm women were interested in how to handle electrical equipment properly and were anxious to use electrical labor savers whenever possible.

The writer and other members of the staff often accept the hospitality of farm homes in all parts of the state. Although we have made no attempt at a survey, our observations are that a properly lighted farm home is rare indeed. The home lighted by kerosene lamps is almost invariably dark and gloomy. On the other hand, the homes with electric lights are too often brilliantly lighted in spots by clear, gas-filled lamps, no attempt being made to protect the eyes of the children from intense glare or to illuminate properly the table where they are "doing their lessons" at night. In either case the farmer himself cannot keep awake long enough to read his daily paper. He does not realize that his eyes are closing in self-defense.

The promotion of better farm-home lighting, therefore, appealed to Prof. L. J. Fletcher, head of the Division of Agricultural Engineering, as a good place to improve our electrical contact with the California farm.

A general policy of the Agricultural Extension Service in California is to use actual demonstrations rather than abstract lectures to present information at meetings. Demonstration of lighting effects by the use of ordinary commercial units was at the outset deemed desirable. To carry out this idea involved considerable experimentation. The primary requirements to be met were as follows:

1. Object lessons and effects must be simple, clear and striking.
2. The various steps of the demonstration must follow without delay.
3. The demonstration must be given by one person.
4. The equipment should be durable and easily assembled.
5. The equipment should be safely packed in units transported by motor truck.

The result attained by members of the Agricultural Engineering and the Extension Service staffs in attempting to meet the above requirements was shown at the meeting of the Commercial National Section of the National Electric Light Association at San Rafael, Calif., Nov. 19-21, 1924. The set-up at San Rafael showed the first steps in the better farm-home lighting campaign, namely, the fundamental principles of good lighting and the simple application of these principles to kitchen illumination.

Details of Exhibit Construction

A knock-down frame of ½ and ¾-in. iron pipe is assembled to form a room 10 ft. long, 5 ft. deep, with an 8-ft. ceiling. Four 60x96-in. window shades hang from the upper members of the frame forming the back wall and two ends of the room, the front being open to the audience. The ceiling is of canvas attached to rollers which are mounted on top at either end of the frame. Ten feet of this canvas is white and an equal amount brown, so that either color or one-half of each can be used by turning the rollers to the desired position.

Three ceiling outlets are provided in the form of ¾-in. Condulets, each supported by conduits across the top members of the frame. The middle

conduit is rigidly assembled into the frame by tees, but the other two are movable lengthwise of the room. Circuits leading to these ceiling outlets plug into duplex convenience receptacles mounted on a board which forms the upper trim. Each of these circuits is controlled by standard flush switches mounted on a board forming the trim of the left side. A fourth switch controls the circuit supplying small lamps in the upper forward corners of the room. These lamps are invisible to the audience and are used to light the room dimly while units are being changed. Connection to the house circuit is made on the board on which the switches are mounted. Two duplex convenience outlets are groove in the base slides over two $\frac{1}{4}$-in. iron pins which extend through the ceiling conduits. Electrical contact is made with the sockets by means of fixture wire and attachment plugs which plug into the ceiling outlets. All the fixtures to be used are assembled on their bases and the lamps inserted prior to the demonstration. These complete units are then placed in a sort of cupboard which stands in one corner of the room.

Method of Presentation

In presenting the demonstration a brief introduction is given on light and the eye. Then follows a short story of the lamp, showing the steps from

The lighting exhibit set up ready for a demonstration. Note overhead conduit and cupboard for storing units.

placed on the right-hand trim, one at the baseboard level, the other at a height of 36 in. Although these convenience outlets are used during the demonstration for plugging in attachment cords, the main purpose is to sell the audience the convenience receptacle idea.

To facilitate changing units, the various sockets, ceiling flanges and canopies are attached to board bases 6 in. square. These bases are slotted and built up as shown in the accompanying diagram. The the candle to the present-day type of lamp. The characteristics of the various lamps now in use are demonstrated, and the proper application of each type is defined. The use of the various types also is referred to during the demonstration of the units. Charts, placards and simple objects of various sizes and colors are placed around the room to show the effects of different lighting schemes. They take the place of eye-test charts which we at first tried out.

A group of placards which are kept together by

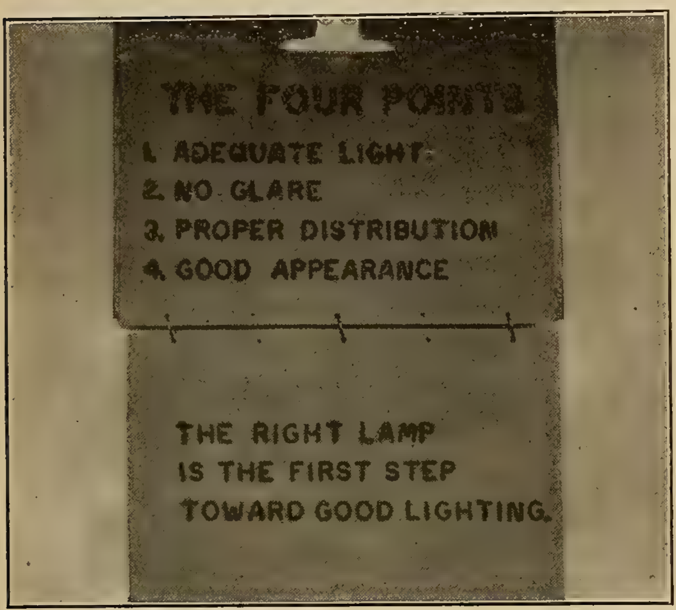
rings is suspended on the back wall. These follow the demonstration step by step, outline the story, emphasize the point and serve as an eye test of the illumination effect being shown. The first placard which the audience sees before the show starts is:

GOOD LIGHT
WHAT IS IT?

Th next placard outlines the story:

THE FOUR POINTS
1. Adequate Light
2. No Glare
3. Proper Distribution
4. Good Appearance

THE RIGHT LAMP IS THE FIRST STEP
TOWARD GOOD LIGHTING



The placards used to outline the story are mounted similar to a loose-leaf book. Fifteen placards comprise the set.

The importance of the first point, adequate light, is shown by having the room dimly lighted with a 10-watt lamp, the audience being asked to notice the details in the room and read the placards; then the light is increased, showing more detail and permitting easier and faster reading. The next placard is a follow-up on the amount of light:

GET MORE LIGHT BY
1. Larger Lamps
2. More Units
3. Lighter Wall Colors
4. Better Distribution

PLENTY OF LIGHT ON THE WORK
BUT LITTLE LIGHT IN THE EYES

After increasing the light to 100 watts with a Mazda C clear lamp, the subject of glare is taken up, what causes it and how to avoid it. The placard shown reads:

CAUSES OF GLARE
1. Light Source Too Bright
2. Lamp in Line of Vision
3. Excessive Contrast
4. Glossy Surfaces

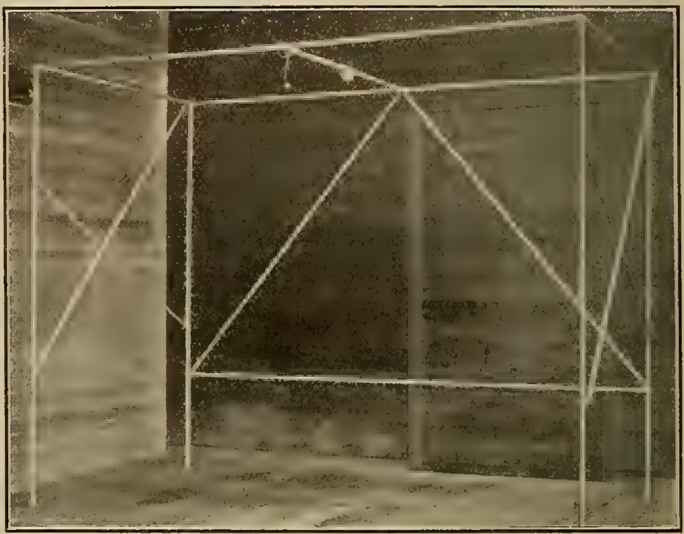
BARE LAMPS IN THE FIELD OF VISION
SHOULD BE AVOIDED

Some methods of overcoming glare are indicated on the following placard:

ELIMINATE GLARE
1. Large Shades
2. Enclosing Globes
3. Frosted Lamps
4. Correct Location

BUY ILLUMINATION—NOT "FIXTURES"

In the meantime various simple units are demonstrated, such as the bare lamp, a similar lamp under a 10-in. metal cone reflector and one in a white glass shade. The comparative glare and light distribution in each case are shown distinctly by having two or three units hanging side by side from the ceiling. One is lighted for a few seconds, the audience noting the effect in the room. Then, when the first unit is switched off, the second one is turned on


Pipe skeleton of demonstration room.

immediately. This method makes a striking comparison of the characteristics of different luminaries.

At this time the matter of shadows is also considered. The placard to accompany this part of the story reads:

AVOID SHADOWS BY
1. Large Diffusing Globes
2. Local Light on Work
3. Light-Colored Walls

DON'T STAND IN YOUR OWN LIGHT

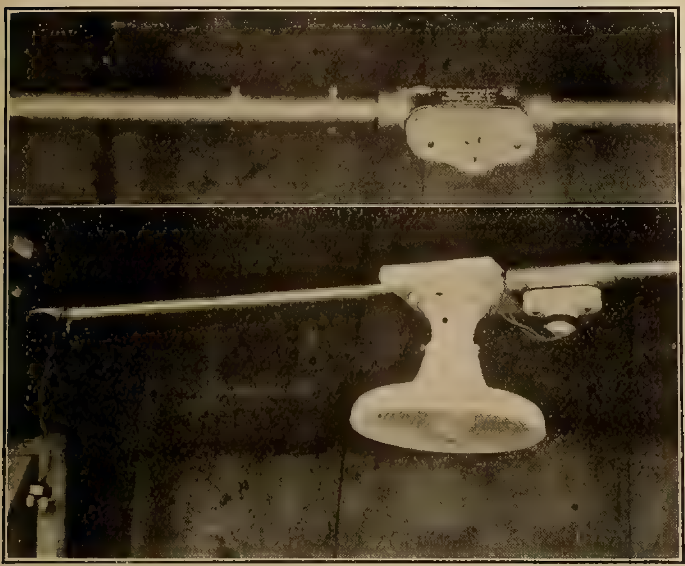
Then some of the common ceiling units are demonstrated, showing the effect of white lamps in softening shadows. The use of wall brackets for local lighting over the sink or stove also is demonstrated.

The effect of wall and ceiling colors on illumination is particularly important. To emphasize this part of the better-lighting idea this placard is shown:

REFLECTION EFFICIENCY
White, 80 per cent
Grays, 40 to 70 per cent
Buff, 60 per cent
Sky Blue, 36 per cent
Dark Brown, 16 per cent

LIGHT CEILING AND WALL COLORS
HELP ANY LIGHTING SYSTEM

To demonstrate the effect of ceiling colors the canvas is rolled until half the ceiling is white and half brown. Then, by means of an 8-in. enameled steel bowl reflector, all the light is directed on to the white portion of the ceiling, then quickly to the



Above is a ceiling outlet mounted on conduit through which are two ¼-in. pins for supporting the quick-change base. One of the bases and fixtures is shown mounted on the conduit and connected to the outlet in the lower picture. Note plug (at left) for connecting conduit circuit to main circuit.

brown so that a marked difference in the resulting illumination is clearly seen. The foot-candle meter shows the light ceiling to reflect over three times as much light as does the brown.

The last placard summarizes the advantage of:

GOOD LIGHT

1. Protects the Eyes
2. Makes Work Easier
3. Prevents Accidents
4. Makes a House a Home

GOOD LIGHTING IS HEALTHFUL, USEFUL AND ENJOYABLE

All of the material for the exhibit is packed in three boxes and three packages of pipe.

The demonstration takes about one hour and is intended primarily for Farm Center meetings. These are the monthly meetings of the rural farming communities which are a part of the state Farm Bureau Federation.

It is our hope that when we work in a community the local electrical people will attend the demonstration, become familiar with the things we have shown the audiences and, after we are gone, help to follow up the program of better farm-home lighting.

Packing and Transportation

The method of packing and transporting the exhibit will be of interest to the one who gives this demonstration and moves it from place to place. The cupboard, which is shown in the photograph of the complete set-up, is a wood packing case 6 ft. long. In this are packed the curtains, ceiling and conduits. The glassware is removed from the metal holders, and each piece is wrapped in wadding and placed in a chest, 3 ft. long, 18 in. wide and 18 in. deep, which is divided into small bins. The lamps are placed in a case divided into individual compartments for each lamp. The framework is assembled into sets held

Knock-down exhibit on truck ready to be transported to another lecture.

by wooden clamps which when ready for transportation look like small heating coil units. The total equipment packs in three cases and three bundles of pipe, the longest of which is 8 ft., the length of the truck body. The weight of this equipment is about 800 lb. We transport it along with some of our other extension equipment on a one-ton speed truck.

Demonstrations conducted in rural districts of the Sacramento Valley to date have met with great success. As further demonstrations are held, it is believed that ideas for the improvement of the exhibit will be brought out. In the meantime the story of electricity and better lighting is being brought home to the farmer in a practical manner. Undoubtedly the idea is worthy of application in other agricultural sections of the country.

CENTRAL STATION CONSTRUCTION OPERATION AND MAINTENANCE

Latticed Steel Used for Heavy-Duty Terminal Poles

Successfully meeting the heavy-duty requirements of terminal poles at generating plants and substations, the Southern Colorado Power Company, Pueblo, Colo., is using latticed steel poles. These structures have proved to be more satisfactory for this class of extra heavy-duty service than wood poles and at the same time present a much neater appearance.

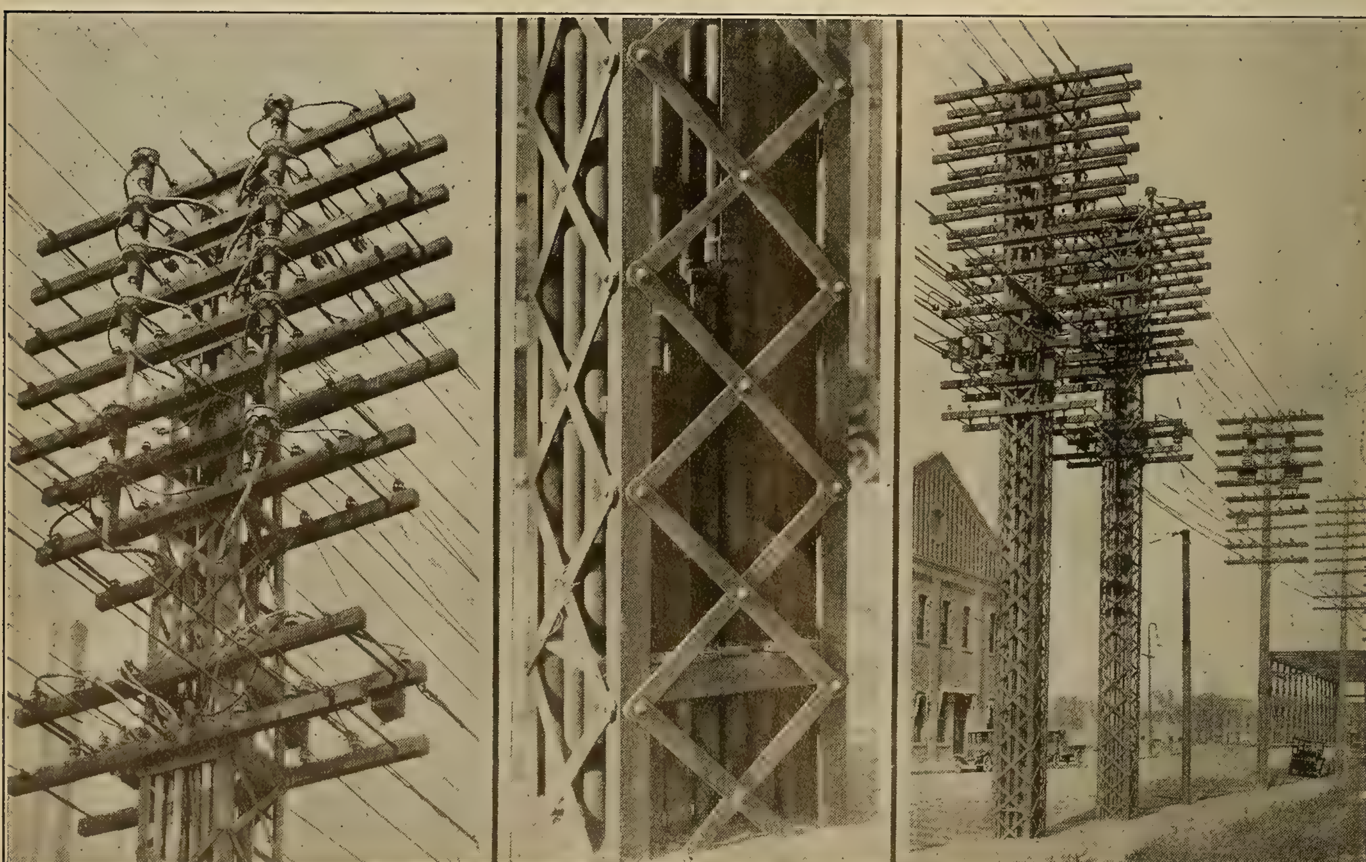
These poles are made up of four 3½x3½x⅜-in. angles laced together with 2½x⅜-in. bars spaced approximately 2 ft. apart, except for the three lower lattices on one side of the pole and below ground, which were omitted to permit the entry of the conduits. Three ⅜-in. plates are provided on the side opposite the conduit-opening space for additional rigidity. Four 12x5/16-in. plates and four 3x3x5/16-in. angles form the lower footing. The main support is comprised of two 6x4x⅜-in. angles 5 ft. 6 in. long, two 18x5/16-in. plates of the same length, and two 9x18½x5/16-in. bearing-plates. One long plate and angle, riveted together, are mounted on each side of the pole in the same plane as that of the crossarms. The bearing-plates, of course, span between the extensions of these side pieces on either side of the pole under the 4-in. flange of the angles, providing a 333 sq.in. bearing surface. The structure is set in a concrete foundation to which the bearing-plates are bolted by four ⅞-in.x2-ft. anchor bolts. The base of the pole is 8 ft. 6 in. below the ground line. The pole is 28 in. square from the bottom to a point 14 ft. 9 in. from the top, tapering to a dimension of 16x21 in. at the top, and stands 44 ft. above ground.

Five-sixteenths-inch plates are riveted to the pole at the proper intervals to provide bases upon which are mounted the crossarms. The 6-pin arms are 9 ft. 4 in. long, and the 8-pin arms are 12 ft. long, both being standard 4x5-in. arms otherwise. Steel guys stretch between poles to equalize the dead-end pull of the lines. Space was provided for the mounting of two 2,300-volt multigap lightning arresters on each crossarm carrying these circuits.

Eighteen No. 4/0 copper 2,300-volt primary circuits, eight arc circuits and seven 500,000 cir.-mil, 600-volt railway feeders are brought out through the twin-pole structure, and provisions left for several future circuits.

Potential Transformer Protection Scheme Using Resistors

Potential transformers are commonly used to energize electrical meters and devices, the incorrect operation of which would in most cases cause serious operating difficulties. Automatic generator-voltage regulators, protective relays, indicating and recording meters, and similar important equipment are entirely dependent upon potential transformers in many plants. Due to this importance, fuses in the potential transformer circuit are entirely omitted, and the transformers connected solidly to the station busbars at many important stations. In these instances fuses have been done away with because it has been found that fusible conductors of the proper current-carrying capacity to afford electrical protection have been



Showing the steel twin-pole terminal structure which has given about twelve years of satisfactory service at the Pueblo steam plant of the Southern Colorado Power Company. Eighteen 2,300-volt 4/0 feeders, eight arc circuits and seven 500,000-cir. mil railway feeders take off from these poles. They stand 44 ft. above ground level, 26 ft. to the lowest crossarm, and are set 8 ft. 6 in. deep.

the cause of many system interruptions on account of mechanical failure of the fuse link itself. The exact cause, or causes, of the deterioration of these physically small fuses is a question somewhat under dispute, but the accepted fact remains that they do seem to deteriorate gradually and to open the circuit without apparent cause. The gradual corroding of the small conductors required for this service and the constant vibration to which they are often subjected tends to bring about mechanical failure under perfectly normal operating conditions.

Potential transformers of more than 200 volt-amperes are seldom used. The full-load primary current of an 11,000-volt transformer of this rating would be but approximately 0.02 amp., and of a 66,000-volt transformer only one-sixth of this, or about 0.0033 amp. The short-circuit impedance of a potential transformer is low, being somewhere near 2 per cent on the average. At this figure, with the secondary terminals short-circuited, the primary current would be but 1 amp. at 11,000 volts, and correspondingly less at 66,000 volts. Therefore it is obvious that a fuse of more than 1 amp. normal rating would afford no protection whatever against trouble developing in the external secondary circuit. Since high-voltage fuses of a 1-amp. rating have frequently failed for no apparent cause, it is necessary to use a fuse of a higher rating to obtain mechanical strength and thus sacrifice adequate protection, to renew fuses frequently, or to eliminate them entirely and connect the transformer solidly to the station bus.

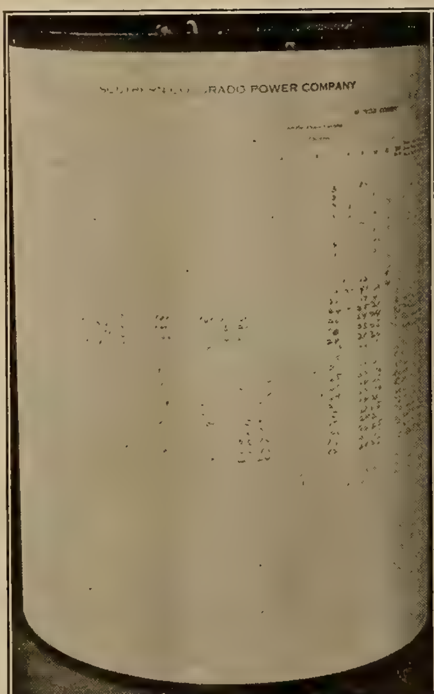
If fuses are omitted altogether or are of too high rating, a short-circuit in the secondary wiring will damage the transformer because of excessive heating. When failure of the insulation results, the short-circuit current may destroy the fuses, if they are provided, or the primary leads themselves may be destroyed. In either case the arcing, which is likely to develop between phases or between one phase and ground, may cause a serious disturbance or even a total interruption to service. Hence, if immunity from unnecessary failure of voltage is sought by using primary fuses of excessive rating or by their entire omission, not only is the transformer without adequate protection, but serious trouble is likely to develop if the transformer fails.

In some large plants resistances of low values are connected in series with each primary fuse. This serves to reduce the short-circuit current, even under the worst conditions, to a value that the fuse can safely rupture. For example, if a 10-ohm resistor be connected in series with each of the two fuses required to protect a single-phase 200-volt-ampere 11,000-volt transformer, the total resistance in series with the primary winding would be 20 ohms and the maximum possible short-circuit current would be 550 amp., and this only when the short occurs practically at the terminals of the transformer. Since the 20-ohm resistance would occasion a power loss of but 0.008 watt and a voltage drop of but 0.4 volt at full load, the effect on the secondary side is quite negligible.

Although the market affords primary fuses which will effectively isolate a 200-volt-ampere transformer if the secondary terminals are short-circuited, the scheme of placing fuses in the secondary wiring as close as possible to the transformer offers certain advantages. This method of protection also is used in some important stations. By selecting secondary fuses on the basis of the actual secondary load, the transformer can be well protected against trouble occurring in the secondary wiring. Then primary fuses, which should be connected in series with suitable resistors, would function only in event of trouble within the transformer itself and could safely be rated high enough to possess ample mechanical strength.

Fibre Cylinder Used to Carry Station Report Sheet

Due to the difficulty in handling and keeping clean the large, unwieldy sheets used for the daily station operation and meter reading records, the operators at the power plant of the Southern Colorado Power Company, Pueblo, Colo., made up the fibre cylinder shown in the accompanying illustration for this purpose. The holder is approximately 9 in. in diameter and is braced with brass strips on the inside. A handle is also provided inside of the cylinder that affords the operator an easy means of handling while recording his meter readings. In this way the record sheets are kept clean and free from wrinkles.



Handy device for carrying station reports used by Southern Colorado Power Company operators.

Primitive Definition of Engineer Is Brought to Light

In quoting Marcus Vitruvious, who lived about 150 B.C., Hubert C. Ferry of Los Angeles, Calif., gives an interesting definition of an engineer. His definition is:

"He should be a good writer; a skillful draftsman; first in geometry and optics, expert at figures; acquainted with history; informed on the principles of natural and moral philosophy, somewhat of a musician; not ignorant of the sciences, both law and physics; nor of the motions, laws, and relations to each other of the Heavenly bodies.

"A normal philosophy will teach him to be above meanness in his dealings and to avoid arrogance. It will make him just, compliant and faithful to his employer, and, what is of greatest importance, it will prevent avarice gaining an ascendancy over him, for he should not be occupied by thoughts of filling his coffers, nor with the desire of grasping everything in the shape of gain, but by the gravity of his manners and a good character, should be careful to preserve his dignity."

Old Steel Tunnel Forms Used for Powder Magazine Walls

In building powder houses on the Big Creek project, the Southern California Edison Company in several instances made use of used steel tunnel forms after they had served the purpose for which they were originally intended. These forms consist of steel plates, 2 ft. square. They are set up in parallel rows about 2 ft. apart and maintained in this position by a steel frame with an internal means of holding the plates. The space between the inside plates and the outside plates is filled with earth as an insulating medium. The walls are about 10 ft. high.

The roof is carried on lines of posts so that the walls do not carry any external weight. Planks are fitted on the purlins and the space between these and the upper edges of the rafters is also filled with earth. The roofing proper is corrugated iron.

These powder houses have been found to possess the advantages of underground storage houses and do not have many of the disadvantages of the underground houses.

Concrete-Filled Gas Pipe Used for Trestle Supports

Concrete-filled gas pipe forms the supporting structure of a conveyor trestle in operation at the plant of the Victoria Gas Company, Victoria, B. C. The trestle is designed to carry an automatic gravity incline used in connection with the open pile coal storage system adopted for this plant. It is constructed over a reinforced concrete tunnel having gates at intervals in the roof discharging on to a belt conveyor which in turn carries the coal to the retorts.

The trestle supports and cross braces are constructed entirely of 4-in. and 6-in. cast iron gas pipe filled with concrete. Ordinary concrete beams, reinforced with twisted square bars, are placed in the middle and at the top of each column structure and are the only reinforcement used. The pipe-lengths are merely embedded in the concrete of the beams, and are not bonded together by wire or bolts. The trestle is approximately 20 ft. in height and is designed to carry stresses in compression only.

K. M. Chadwick, engineer of construction, designed and built this structure in order to use up an overstock of pipe and to keep down the cost of the plant as much as possible.

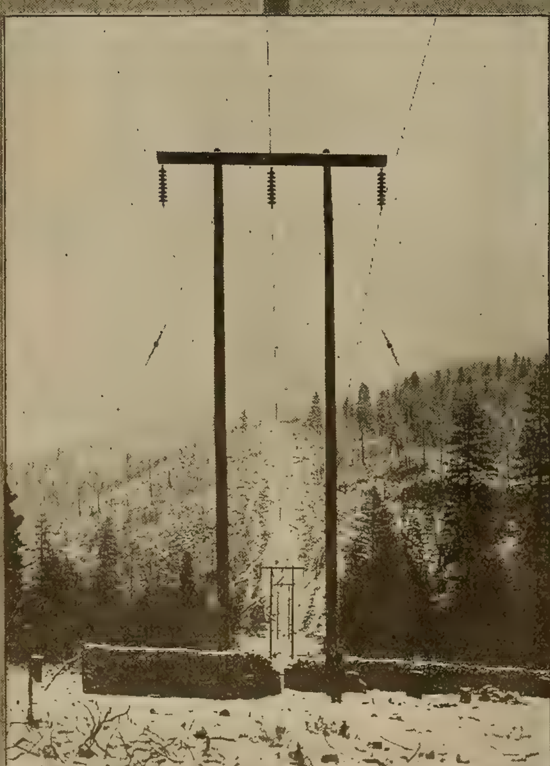
New High-Tension Power Line Completed and Put Into Service in Northern California

The California Oregon Power Company has recently completed and placed in operation its new 110-kv. line, known as Line 14. This line extends from the company's Copco No. 2 plant on the Klamath River south to Delta, Calif., where the energy transmitted enters the system of the Pacific Gas and Electric Company. The new station represents a development of 30,000 kw. and is expected to be completed in May, 1925. Pending the completion of Copco No. 2, energy is being supplied from other plants on the California Oregon system.

The line is 77½ miles long. The right-of-way traverses flat and rolling country throughout the northern section, and rough, mountainous country down in the southern section. Six hundred feet is the average span, while the longest span is 1,666 ft. The three conductors are each 250,000 cir.-mil, 19-strand copper and are carried at a normal spacing of 10 ft. 6 in. horizontally with a minimum ground clearance of 30 ft. Eight high-strength units make up the insulator strings used on angle and strain towers, while seven standard units suffice for suspension towers.

The twin poles comprising the "H" type towers are set 10 ft. 6 in. apart, 7 ft. deep in soft soil and 6 ft. deep in solid, rocky locations. These structures are side-guyed with 7/16-in. high strength steel cable where long spans are encountered, but not for normal spans except where pole-top sectionalizing switches are installed, in which case three-way or four-way storm-guying is used for additional rigidity. Three-pole towers are used for heavy-duty angle structures.

Crossarms are mounted 52 ft. above ground level on standard structures and are arranged on special structures to suit particular conditions and afford the desired ground clearance. On transposition towers there is an extra crossarm necessary, and this is mounted so as to provide 10 ft. in the clear between arms. The total cost per mile of this line was about $9,000.

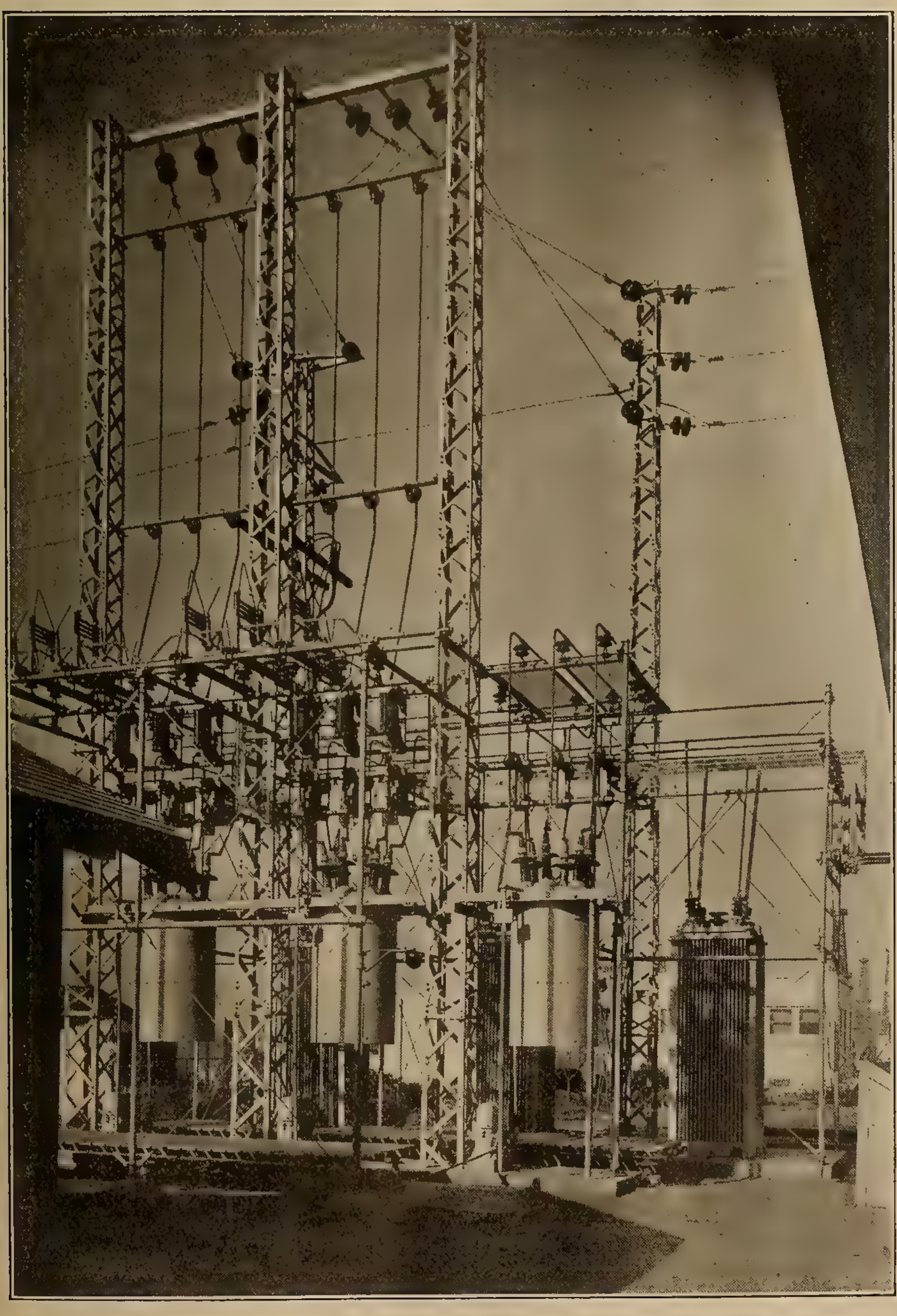


Novel Safety Kit Reduces Injury From Burning Clothing

Accidents frequently happen through which the clothing of a man, or perhaps of several men at one time, catch fire. Fortunately these fires are not serious in most cases and are easily extinguished with little or no damage. However, it sometimes happens that burning oil is blown or scattered over several persons or that clothing accidentally becomes saturated with gasoline and catches fire. Ordinary means will not extinguish such persistent fires before serious damage is done to the victim. Having experienced this, a southern California utility company has installed at many favorable locations about its plants boxes, each containing two woolen blankets for emergency first aid use in such cases.

These boxes are fastened to the wall, are airtight and are fitted with glass fronts. Felt packing is fastened to the edge of the box to afford a seat for the glass panel and to make the joint tight enough to keep out dirt and moisture. This panel is mounted securely in place each time the box is refilled and must be broken to provide access to the blankets. The fact that the glass must be broken to get at the blankets assures that they will not be used indiscriminately, and hence will always be available for really serious emergencies when every second of delay counts.

Blankets for this purpose need not be new, nor do they need to be scrupulously clean to serve adequately as intended. The investment represented is practically nothing. However, when they are needed they may be worth several thousand dollars apiece, to say nothing of the lives that they may save and the suffering that they may forestall.



Los Cerritos Substation, Long Beach District, Southern California Edison Company. This substation has an installed capacity of 3,000 kva., is fed at 11,000 volts from two sources and distributes energy over several 2,300-volt feeders serving both industrial and lighting load. The station is somewhat typical of distribution installations in semi-residential districts.

Photographic Records Cut Cable Maintenance Expense

The camera as a worth-while adjunct to the maintenance engineer has been proved to the satisfaction of a certain English power company. The incident which first caused the use of a camera for the purpose of recording the position of underground splices or recording the location of various cables and conductors in a man-hole illustrates in itself the advantage of this method.

A set of 10,000-volt cables was laid to supply a remote substation, and a fault having developed, it was decided to cut at about the middle of the cable-length. This point happened to be out in a large field. Drawings on file showed the location of the cable trench with respect to a driveway which subsequently had been moved. However, it was not until much digging had been done in several directions from the supposed location that the cable was located and the fact established that the driveway had been moved since the cable was laid.

The use of a camera for definitely locating such remote points is quite simple and effective. In this particular case, every time a cable-joint is located, a trench intersection made, or any other point of possible future importance established, photographs taken of the place in question from at least two different positions are made and the pictures filed. The pictures are so taken that the lines of sight are somewhere near at right angles to each other.

A small camera produces results that are just as satisfactory for this purpose as those produced by more expensive outfits.

TEN LITTLE LINEMEN

Ten little linemen, starting for the line,
One fell off the line truck, then there were nine.

Nine little linemen, raising up a weight,
One let go the hoisting rope, then there were eight.

Eight little linemen, climbing up to heaven,
One dropped his hand-axe, then there were seven.

Seven little linemen, putting up the "sticks,"
One let go his pike-pole, then there were six.

Six little linemen forgot "she was alive,"
One stood on the messenger, then there were five.

Five little linemen, on the ground once more,
One upset the solder pot, then there were four.

Four little linemen, trimming up a tree,
One trimmed the "high line," then there were three.

Three little linemen, hustling to get through,
One forgot his safety belt, then there were two.

Two little linemen, job is almost done,
Tapped in on the wrong line, then there was one.

One little lineman, the last of the bunch,
Swears he'll always play it safe—IT PAYS, STICK TO HIS HUNCH!

—Cactus Points, El Paso Electric Ry. Co.

IDEAS FOR THE CONTRACTOR

Practical Accounting for Contractors and Dealers

BY F. V. MITCHELL

After all the entries made up to this point have been posted to the proper General Ledger accounts, the items of Overhead Expense that were not allocated direct to a department are distributed over the three departments on the vases outlined in the July 1, 1924, issue of the Journal of Electricity. Departmental Distribution of Overhead Expense for the month can then be prepared from the General Ledger Expense Accounts in accordance with illustration contained in Fig. 1, from which the following monthly closing journal entry is made:

Description	Acct. No.	Dept. No.	Dr.	Cr.
Work in Process Account....................	15	1	$2,712.82	
Do	15	2	899.11	
Merchandise Account	10	1		$2,712.82
Do	10	2		899.11
Material put into jobs during October, 1924.				

There are two interesting features in connection with the data compiled as shown in Fig. 1 that are well worth mentioning at this point. First, it will be noted that no charge appeared in the books on the Taxes and License Account for the month of October, 1924, and that a charge of $201.35 appeared on the Insurance Account during that month. This result was due to the fact that no bills were taken into Accounts Payable during the month that would have been chargeable to Taxes and License Account, whereas bills amounting to $201.35 chargeable to Insurance Account were taken into Accounts Payable during that month and which premiums applied to policies covering for a period of one year as customary. Of course, as far as the yearly results are concerned, the correct Overhead will be obtained under this method, but it does to some measure affect the current monthly percentages. Although there is some objection to the little extra amount of clerical work incurred, no doubt remains that the better way to obtain a truer monthly Overhead is to charge such items to a Deferred Charges Account when the bills are taken into account and each month during the yearly period covered charge one-twelfth of the total to Expense through journal entry. The debit balance remaining in the Deferred Charges Account at the end of each month would represent the unexpired values of Insurance Premiums or Taxes and Licenses paid in advance, and would be carried on the Balance Sheet as an Asset.

DEPARTMENTAL DISTRIBUTION OF OVERHEAD EXPENSE — OCTOBER 1924 —

Acct No.	Account	Total	Wiring	Fixtures	Store
60	Advertising	100.00	63.23	26.19	10.58
61	Automobile Expense	275.00	185.00	72.50	17.50
62	Depreciation	119.55	75.61	31.30	12.64
63	Doubtful Accounts	86.35	56.65	23.50	6.20
64	Freight, Drayage & Express	52.70	22.50	30.20	
65	Heat, Light & Power	35.40	22.37	9.29	3.74
66	Insurance	201.35	87.75	100.68	12.92
67	Interest & Discount-Net	Cr. 48.00	Cr. 30.39	Cr. 12.54	Cr. 5.07
68	Miscellaneous Expense	31.50	19.93	8.24	3.33
69	Rent	125.00	45.00	50.00	30.00
70	Salaries	1497.75	773.25	549.50	175.00
71	Stationery, Printing & Office Supplies	65.75	41.45	17.17	7.13
72	Taxes & Licenses	-0-			
73	Telephone & Telegraph	19.50	12.34	5.10	2.06
	TOTALS	2561.85	1374.69	911.13	276.03

Fig. 1.

Second, it will be noted that the Interest and Discount Account showed a net credit balance of $48 for the month and is a deduction for the total Overhead for that month. This result is perfectly in order as the total amount of discount earned as shown in the Cash Book-Journal was $81, whereas the total amount of discount allowed was $33. The net credit balance may not show as large an amount at other times, especially if any Notes Payable are taken out with a bank, in which event the interest on same would be charged to this account when paid. However, the amount earned by discounting Accounts Payable Invoices and credited to this account will always be considerably in excess of the charges to the account, even though it may be necessary at times to negotiate a loan from a bank on an interest-bearing note to provide the necessary funds to take advantage of cash discounts offered if bills are paid upon stipulated dates. Therefore, any net amount earned in this manner is justly a deduction from Overhead Expense, because any interest paid on past due Accounts Payable (the directly opposite) would necessarily be a charge to Overhead Expense.

Now that the total amount of Overhead Expense chargeable to the Wiring and Fixtures Departments has been ascertained, the List of Labor and Material put into jobs during the month carrying their exact proportion of the total Overhead for the month, is shown in Fig. 2. It will be noted that the total amounts of Labor on this list are the same as that which appeared in the distribution of the payroll journal entry charged to Work in Process Account in the Dec. 15, 1924, issue of the Journal of Electricity, and the following journal entry is made for the total amounts of material that are shown on this list and which amounts have been ascertained from the Job Cost Sheets:

Description	Acct. No.	Dept. No.	Dr.	Cr.
Work in Process Account....................	15	1	$1,374.69	
Do	15	2	911.13	
Cost of Goods Sold—Overhead...........	52C	3	276.03	
Overhead Expense Clearing Acct.	60 to 73			$2,561.85
Departmental Distribution of Overhead Expense—Month of October, 1924.				

LIST OF LABOR & MATERIAL PUT INTO JOBS DURING MONTH OF OCTOBER, 1924 —

— WIRING —					— FIXTURES —				
JOB NO.	LABOR	MATERIAL	TOTAL	OVERHEAD	JOB NO.	LABOR	MATERIAL	TOTAL	OVERHEAD
500	75 25	149 70	224 95	74 98	500F	21 60	45 25	66 85	46 80
503	27 60	53 75	81 35	27 12	503F	17 45	36 10	53 55	37 49
507	54 15	107 90	162 05	54 02	507F	22 50	46 35	68 85	48 20
510	142 50	284 65	427 15	142 38	510F	57 15	126 20	183 35	128 35
511	173 45	345 20	518 65	172 88	511F	62 30	131 95	194 25	135 97
512	204 70	407 45	612 15	204 05	512F	41 75	85 40	127 15	89 00
513	169 25	338 10	507 35	169 12	513F	53 80	120 65	174 45	122 12
514	211 30	420 25	631 55	210 52	514F	61 25	125 70	186 95	130 86
515	201 45	401 50	602 95	200 98	515F	54 10	122 15	176 25	123 37
516	151 60	204 32	355 92	118 64	516F	10 60	59 36	69 96	48 97
TOTALS	1411 25	2712 82	4124 07	1374 69	TOTALS	402 50	899 11	1301 61	911 13

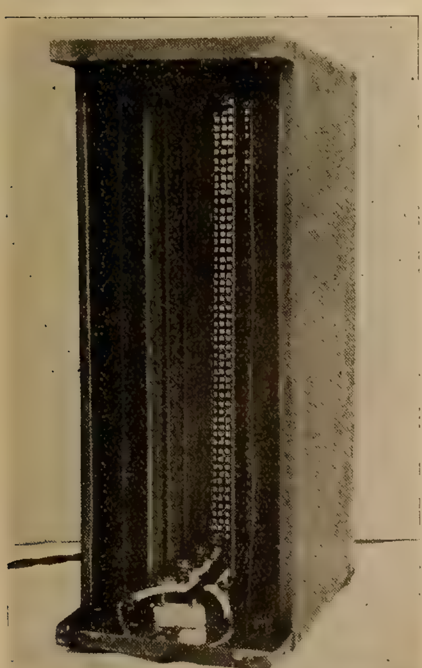
Fig. 2.

New Industrial Application of Electric Heaters

Among the most recent industrial applications of electricity is its use in the sweating rooms of fruit packing plants in the West, where lemons, oranges and grapefruit are sweated before shipment. In the past this process was carried on with coal oil burners to supply the necessary heat, but when a cleaner method was sought, engineers turned to electricity. Upon the installation of electric heaters in sweating rooms, tests were conducted to discover the relative cost of the new method. As a result it was found that the electric heaters were not only more satisfactory than the oil burners, but were less expensive to operate.

The process of sweating fruit usually takes place in rooms approximately 25 ft. long, 15 ft. wide and 10 ft. high. When coal oil was used in the operation, the burners were partially smothered to generate a necessary amount of ethylene gas for properly sweating the fruit. With the installation of electric heaters the gas is supplied in tanks and the heat is turned on only long enough to keep the temperature of the rooms up to between 75 and 85 deg. F., the temperature required for the best results from the process. The fruit is left in the sweating room for from three to five days, during which time the ethylene gas and the heat cause increased respiration by opening up the pores of the fruit and so prepare it for shipment with less danger of spoilage.

An installation of several heating systems in the sweating rooms of the Whittier Select Fruit Growers' Association of California was made recently by the Westinghouse Electric & Manufacturing Company. Each sweating room was provided with a heating unit consisting of four standard Westinghouse space heaters mounted in a sheet metal box. The current in the heaters can be controlled either automatically or manually, so that the heat is turned on only at the times when it is needed. Such control is an important factor in the economy of the new method of heating the sweat rooms.



Bottom view of the assembled heater, showing the space heaters in place with a deflecting plate mounted outside the heater to allow free circulation of air between the plate and the outer walls of the heater.

Many Electragists Adopt Business Principles of U. S. C. of C.

The principles of business conduct, drawn up by the United States Chamber of Commerce and indorsed by resolution at the 1924 annual convention of the Association of Electragists, International, are being accepted by many individual members of the A.E.I., over 350 having returned signed cards in the first weeks after the cards were distributed to the membership.

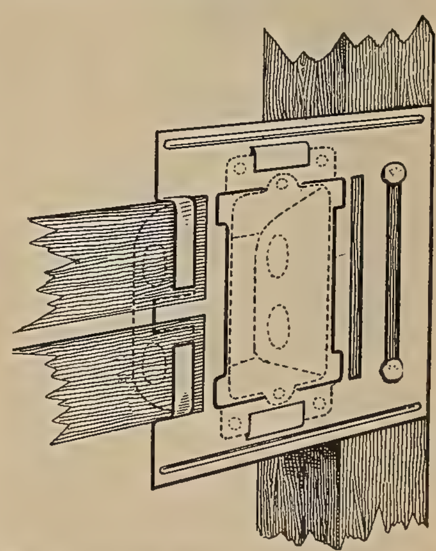
The acceptance of the twelve principles enumerated by the Chamber of Commerce binds the member to carry on his business with constant and efficient endeavor to reduce the cost of distribution, to keep the quality of his merchandise on the highest levels and to give fair treatment to customers, management and labor and always to endeavor to render public service of the greatest value.

The firms and individuals pledging themselves to the observance of these rules receive certificates from the Chamber of Commerce for display in their stores and offices to show that they have accepted the obligation of maintaining high standards in their business.

New Switch Box Hanger Saves Time in Construction Work

Due to the continually mounting labor costs of electrical construction, the thinking contractors are looking more and more for devices that will save labor. Outlet and switch box supports have become almost universally used, as it is easy to see their great labor-saving possibilities. According to statistics presented by several of the more successful contractors, costs of mounting boxes with old-style wood backings vary from 15 to 25 cents per outlet, according to conditions. Their records show that from 5 to 10 cents per outlet can be saved by using one of the better types of supports now on the market.

One of the most convenient devices recently produced is illustrated in the accompanying cuts. These are manufactured by the Handy Hanger Manufacturing Company of San Francisco, Calif. The method of using the ceiling outlet support is apparent. The switch box is secured to the support by means of two lugs that are hammered over the ears of the box. The unit as a whole is then nailed to one stud. The support is of sufficient length to allow the plate to clear a 6-in. door casing.

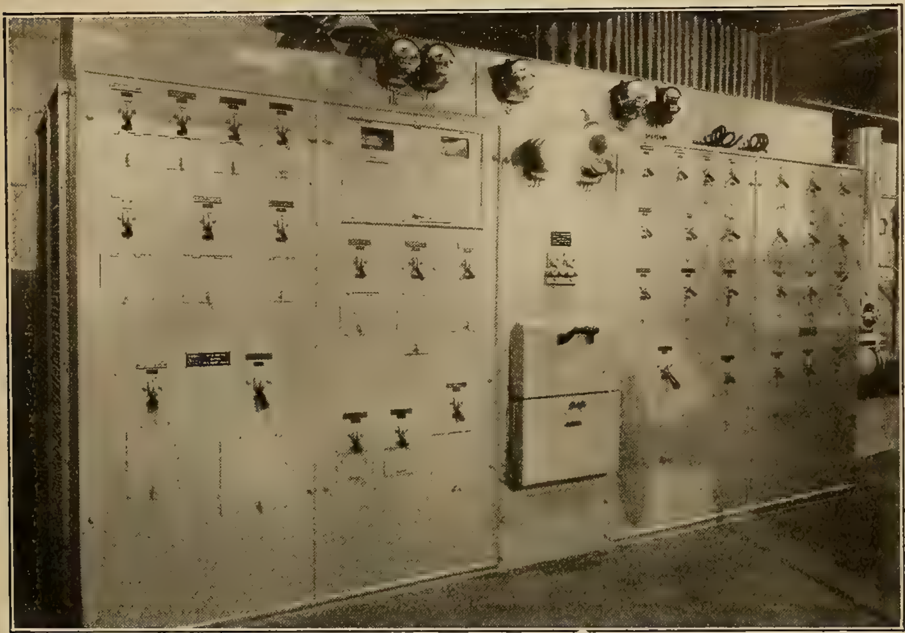


Handy switch box hanger produced by San Francisco manufacturer for saving time in mounting switch boxes. The hanger is fastened to the stud by driving two nails.

Electricity Is Now Used by San Francisco Banks

Extensive Application Is Being Made for Heating Premises and for Equipment of Rest Rooms and Cafeterias

New fields of electrical construction activity are constantly opening up to contractors and dealers. One of the most recent commercial applications to reach considerable proportions is that of electric heating and cooking in banks.



Switchboard installed by Victor Lemoge, electragist of San Francisco, Calif., in the Anglo-London-Paris Bank of that city. The board is of the latest "dead-front" type and was manufactured by the Drendell Electric & Manufacturing Company of San Francisco.

Among the more recent installations of this nature are those in various banks in San Francisco, Calif. Electric heaters for maintaining temperature and electric cooking equipment for company cafeterias have added materially to the efficiency of the forces and have created an atmosphere of good will. The ability to buy a hot meal of excellent quality at a price about 50 per cent of the regular restaurant rates contributes largely to the employees' welfare and helps to raise the morale of the organization. This service is appreciated for many reasons. In stormy weather it permits employees to have a hot lunch without going out into the wet; on days when an employee wants to do shopping, lunch may be quickly disposed of without loss of time in going to a restaurant and there waiting for service; employees are always certain to enjoy the highest quality foods prepared by skilled hands; there is no question as to the cleanliness of the food or utensils, and employees may aid in the makeup of the menu.

Installation of electric air heater in wall beneath teller's windows in branch bank of Anglo-California Trust Company, San Francisco, Calif. Portable heaters are used in private offices, rest rooms and safety deposit customers' private rooms.

One of the most extensive installations in bank cafeterias is that of the Anglo-London-Paris Bank, San Francisco, Calif., where about two hundred employees are served daily, all the food being prepared on electric cooking equipment. Two sections of heavy-duty range are installed, together with electric broiler, coffee urn and a steam table. A staff of Chinese stewards prepares and serves the food.

The Anglo-California Bank has adopted electricity for heating its branch institutions as they are opened, and already has installed this type of heating apparatus in its branch at Market and Ellis Streets, San Francisco. The heaters are installed in the walls wherever general heating is desired, and portable heaters are furnished for the private offices. Thermostats are installed for automatic temperature control. The accompanying illustrations show some of the installations of electrical equipment referred to.

Electrical Inspectors' Association Formed in California

Through the efforts of Claude W. Mitchell, electrical engineer of the Board of Fire Underwriters of the Pacific, San Francisco, and H. W. Stitt, city electrician, Fresno, Calif., the California Association of Electrical Inspectors was formed recently at a meeting at Long Beach, Calif. The membership of this association is made up of the heads of electrical departments of many of the municipalities of California and of various assistants in electrical inspection departments.

The objects in the formation of the organization were the improvement of methods of installation, maintenance and use of electrical wiring and equipment; and the reduction of fire and personal hazards from electrical causes by obtaining and circulating information regarding electrical rules and regulations for electrical practice. It is also the purpose to institute efficient and uniform methods of inspecting and supervising electrical installations; to establish a uniform interpretation of national, state, county and city rules and regulations relating to the installation of electrical wiring and equipment, and to promote closer cooperation between the different branches of the electrical industry and allied interests.

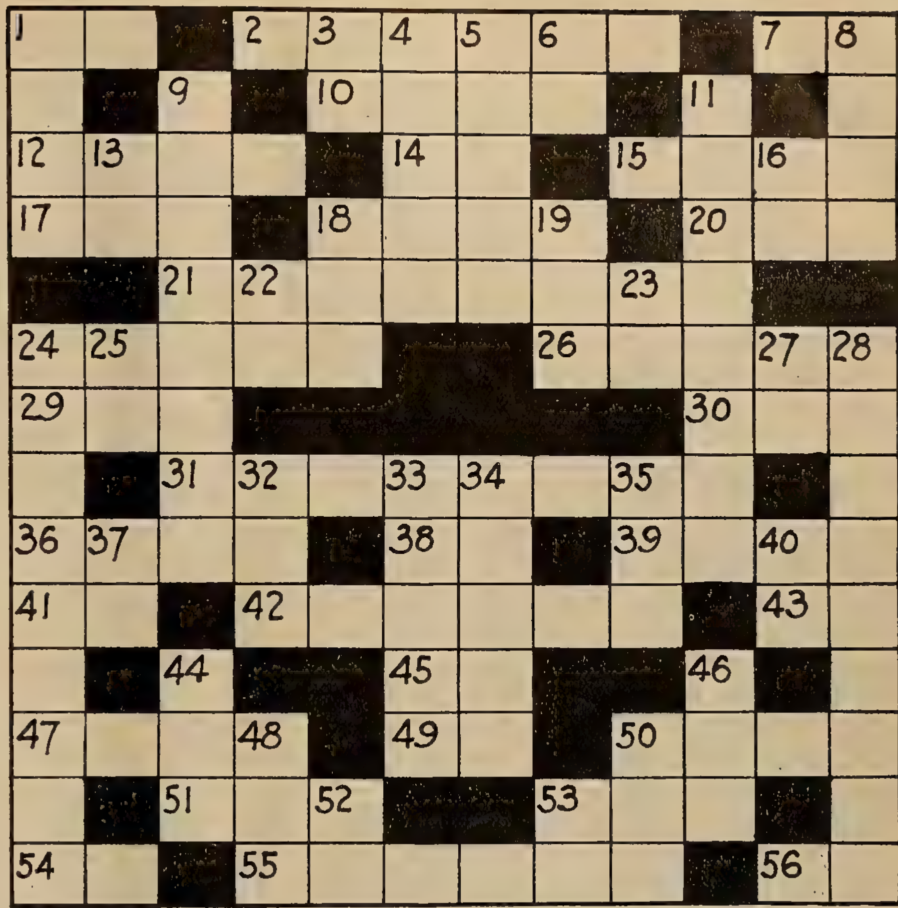
Twelve different cities sent representatives to the initial meeting, as did also the Board of Fire Underwriters of the Pacific and the Industrial Accident Commission, George A. Kimball representing the latter body. The 1923 edition of the National Electrical Code formed the major topic of discussion, and considerable time was spent on the subject of single-pole fusing, identified conductors, services, fusing on grounded circuits, as well as the grounding of secondaries of transformers.

There are three classes of membership: Active, associate and industrial. The first of these covers those who are engaged in inspecting or supervising the inspecting of electrical installations, in behalf of city, county, state or national authorities or some insurance organization. An associate member is one who is engaged in inspecting or supervising the inspection of electrical installations on behalf of public service agencies. An industrial member is one who is engaged in the electrical industry as engineer, contractor, manufacturer or representative of one of these classes of industry.

The officers for the first year of its organization are: H. W. Stitt, city electrician, Fresno, Calif., president; R. W. Abright, city electrician, Long Beach, Calif., vice-president; C. W. Mitchell, electrical engineer, Board of Fire Underwriters of the Pacific, San Francisco, Calif., secretary.

An Electrical Cross-Word Puzzle Contributed by Engineer

The following cross-word puzzle, using terms common to the electrical business, was devised by Claude W. Mitchell, electrical engineer of the Board of Fire Underwriters of the Pacific, San Francisco, Calif. Those who are cross-word-puzzle fans will undoubtedly have a pleasant hour solving this latest product of the electrical industry. The answer to this puzzle will be published in the Jan. 15, 1925, issue of the Journal of Electricity.



Cross-word puzzle devised by Claude W. Mitchell, electrical engineer of the Board of Fire Underwriters of the Pacific, San Francisco, Calif.

Horizontal

1. Below 600 volts (abbr.*).
2. What your radio battery needs when you try to show off your set.
7. Describes a knife switch which works in two directions (abbr.*).
10. It runs from the Ferry Building to the Beach.
12. Units of conductance.
14. A foot used in lumber measure (abbr.*).
15. Switch used on house-lighting circuits.
17. Much sought after in the principal "business" of all electrical conventions.
18. What an electrical man will never do.
20. A measure of flow of liquids (abbr.*).
21. We are from this place when they tell about the success of public ownership.
24. An electrical detour.
26. Several transformers.
29. Gymnotus electricus.
30. The original loud speaker.
31. Current strength.
36. A society of electrical engineers (abbr.*)
38. 3.14159
39. May be expressed in circular mils.
41. Twin wires (abbr.*).
42. A voltaic cell having a zinc-platinum couple, the elements of which are used with electrolytes of sulphuric and nitric acids respectively. (Possessive.)
43. The latest type of gas bag.
45. An engineer who is of great assistance to the electrical engineer (abbr.*).
47. Not a closed circuit.
49. 200,000 volts (abbr.*).
50. One form of drive.
51. It helps to hold up a pole.
53. Where the light goes when it goes out.
54. What most key fitters and bell hangers call themselves (abbr.*).
55. Main lines.
56. Not all operated by electricity (abbr.*).

Vertical

1. Edison made one; you can make light of it.
3. A term sometimes employed for magnetization curves (abbr.*).
4. One of the copper bars on an alternating current switchboard (2/3 abbr.*).
5. Wireless.
6. 1/24 pennyweight (abbr.*).
8. Branches on a circuit. Good night.
9. Mathematical expressions.
11. The man who handles the throttle.
13. Electragist's expression when he closes a deal (abbr.*).
16. Add "E" to it and make a monkey of it.
18. A radio magazine.
19. Type of H.T. switch.
24. Part of a railway signal system.
25. A gas about which we have heard much lately (symbol).
27. 1,000 volts (abbr.*).
28. Used in storage batteries.
32. 1,000,000 (abbr.*).
33. In the case of a vibrating body, the time or the angle reckoned from the point of starting to the point of maximum positive elongation. Also an interval of time.
34. Used to fasten parts of a metal tank together.
35. A would-be rival of electricity.
37. Equal to voltage in the simple D.C. formula (abbr.*).
40. Maybe you think this puzzle is.
44. One terminal of a battery (abbr.*).
46. An assembly of radio apparatus.
48. Lots of them used on machinery, etc. If you stay with this long enough you'll be one.
50. Usually found back of a switchboard.
52. Period of oscillation of the Water and Power Act (abbr.*).
53. What we all like to get on our plans.

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*abbr.=abbreviation.

Sell Convenience Outlets for Store Window Display

An investigation into the matter reveals the fact that surprisingly few stores have an adequate number of convenience outlets wired into their windows. It also appears true that those outlets that are already installed have not been placed with reference to their most convenient and beneficial use. It seems that there is a big field for contractors in supplying the deficiency existing in this respect and in thus making it possible for dealers to use their windows to better advantage not only at night but in the daytime as well. Furniture stores in particular depend largely upon convenience outlets for the proper display of floor and table lamps, and music dealers, drug stores, hardware stores and other retail merchants offer good prospects for this class of work.

BETTER MERCHANDISING

Answering the Appliance Operating Cost Question

Appliance Rating Board of Public Service Company of Colorado Shows Cost Per Hour for Any Lamp Socket Device

Since the announcement concerning the appliance rating board of the Boulder, Colo., office of the Public Service Company of Colorado (Journal of Electricity, Dec. 1, 1923, page 409), many requests have come from appliance merchandisers for further details concerning the device.

As originally announced, the appliance rating board is designed as a device for visually showing to the prospective appliance customer the actual operating cost of the particular appliance or lamp under consideration. The board is capable of showing the operating cost per hour of any lamp or appliance, using 1 kw. or less, that is carried by the Boulder office of the company, where it is installed.

The appliance rating board consists of a meter panel, 3 ft. high and 4 ft.

Specially calibrated ammeter mounted on the appliance rating board.

wide, on which are mounted a standard watt-hour meter and an ammeter calibrated to read cents per hour. The costs of operating the electrical devices are shown on two scales, both direct reading, that appear on the ammeter. The outer scale is calibrated for the Boulder lighting rate, which is 11 cents per kw-hr., and the inner scale applies to the power rate of 4 cents per kw-hr.

Along the top of the board are seven flush sockets in a row in which have been placed 15, 25, 40, 50, 75, 100 and 200-watt lamps. Between the watt-hour meter and the ammeter is a doorbell transformer, with a push button and a buzzer. In a row along the bottom of the board are eight toggle switches which control the seven lamps and the doorbell transformer. Below these are a flush receptacle connected to the line and a receptacle with toggle switch and pilot light.

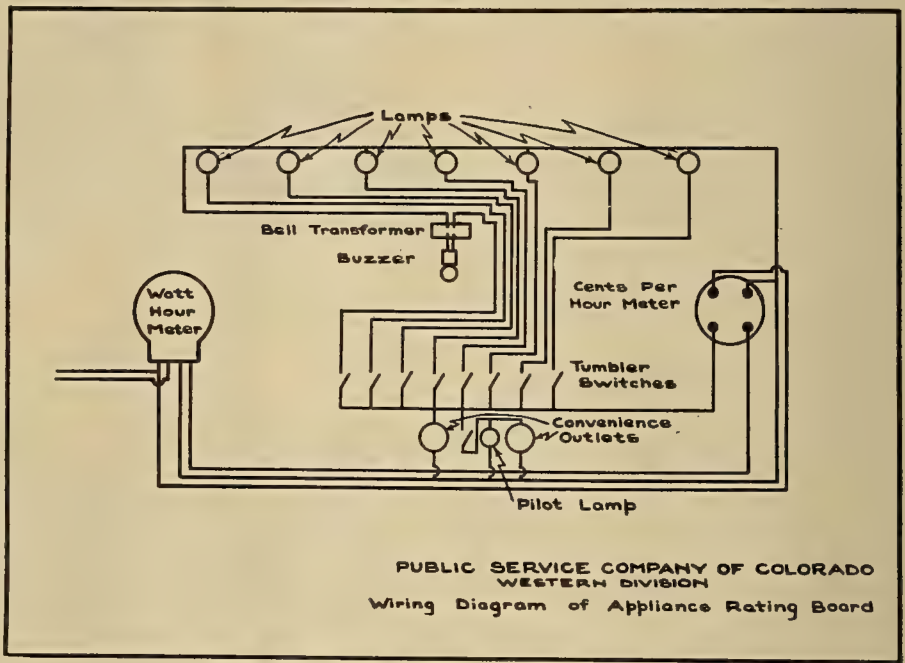
The board is placed on a table in the salesroom and is available at any time. The wiring, all done from the rear, is neat, and the rear of the board presents an attractive appearance as the wood is the same color as the front. By making the back of the panel attractive, the designers have made it practicable to use the board at any location.

In designing the board, F. H. Henderson, Boulder manager of the Public Service Company of Colorado, cooperated with J. T. Lang, who did the actual construction work. The idea for the board was secured from a panel, at the Loveland office of the company, which incorporated only lamps and an ammeter. The total cost of the board as built for the Boulder office was between $75 and $80.

The wiring diagram of the appliance rating board used by the Boulder office of the Public Service Company of Colorado is reproduced herewith. This diagram shows the method of connecting the various outlets so that current for operating the lamps and appliances may be measured on the specially calibrated ammeter. A close-up view of the ammeter used also is presented upon this page. The scale placed on the ammeter was drawn by the designers of the panel.

The appliance rating board has been found to be entirely satisfactory and has aided salesmen considerably in selling electrical appliances. The board, as constructed by Mr. Lang, was fitted with a wooden panel and the builder believes that a better job would result if slate were used instead of wood. Otherwise, the use of the device has shown no defects and the builders are of the opinion that no other changes in the original design are advisable.

With the wiring diagram of the appliance rating board any electrician could reproduce the one used by the Boulder sales department. The cost of the device is such that the investment,



Wiring diagram of appliance rating board of the Public Service Company of Colorado.

made in Boulder, has been returned in the increased sales volume that followed the installation.

The utility of the board at the Boulder office has been found to apply not only to the sale of appliances, but also to the adjusting of complaints. By using the ammeter to show the customer the actual operating cost of the appliance, instead of figuring the consumption of particular devices and then giving the customer a figure which may not be understood, the salesman adjusting the complaint can actually show the cost of operating the devices and in this way present a convincing argument.

The Electric Heating & Manufacturing Company, Seattle, Wash., has the contract to equip eleven new residences now under construction in that city by Mylroie & Chapman, with electric heating systems. Contracts call for the Apfel heating system.

Display room of the International Electric & Machinery Company. This overhead track system facilitates the handling of motors.

Making the Motor Dealer's Shop More Efficient

International Electric & Machinery Company Adopts Layout That Cuts in Half Time Spent in Repairing Motors

Probably one of the most difficult problems of the electric motor house is the arranging of departments so that work can be handled with minimum effort. Add to this the fact that the dealer desires to present an attractive store room and display window and the problem is further complicated.

A solution to the problem has recently been worked out by the International Electric & Machinery Company of Los Angeles, Calif. Under the direction of F. T. Broiles, president of the company, an arrangement has been designed which permits the company to service motors in one-half of the time that was required before the new system was installed. At the same time the building is so arranged that display windows, containing exhibits of motors, lamps and various classes of machinery, are presented to the passing public.

In planning the layout for the building Mr. Broiles laid out a definite route for all work to follow and fitted this route and the general characteristics of the building together. As a result of this routing plan motors that are to be repaired enter the building in the rear and are first taken to the inspection department. This department is situated on the first floor and is equipped with a large test panel to enable the mechanics to locate the trouble. If tests show that the motor is in need of mechanical repair, such as bearing replacement, it is delivered to the mechanical department located on the same floor. If electrical repairs are needed the motor is taken, via hydraulic elevator, to the electrical department on the second floor. After all repairs are made the various parts are sent to the assembly department and when assembled the motor is subjected to thorough tests for several hours. The last operation is the painting of the motor. This work is done with the aid of compressed air and it has been found that the cost is small and the reaction of the customer is exceedingly favorable.

The organization of each department has also been given close attention by Mr. Broiles. Each department is instructed to specialize upon only one class of work and mechanics fitted to do that work are the only ones that are placed there. By thus specializing the work of each man, repair jobs have been speeded up and better results have been secured in all departments.

Mechanical equipment of the latest design has been installed in the various departments. In the machine shop there are drill presses, bench drills, power saw, power press, four lathes and several smaller machines. The electrical department in addition to being separated from other departments is subdivided in small motor repair section, rewinding section, and coil section. Each of the six work benches in the electrical department is equipped with several test switches in order that all work can be completed at the bench without the necessity of taking the part to another section of the room to be tested. A separate stock room is maintained for the repair department in order that the work of this department and of the contracting and installation department may be entirely separate.

Installation work is done by a department that is independent of all other company activities. A foreman is in charge of the department and it is his duty to see that the proper men are assigned to each job. The foreman is also responsible for the checking of the time cards of his men, this being done every day instead of once a week. As the department has its own stock room, the clerk in charge of this is expected to carefully check all material either going to or coming from all jobs. The stock clerk also checks the time cards of the men, as he is familiar with the location of the men in the department. In order to secure satisfactory work the first time that it is done, the company has made a rule that all corrections to defective work must be made on the electrician's time. Few complaints have been received since the application of the rule and it is the company's opinion that the regulation is largely responsible.

The moving of motors about the building has been given serious consideration by Mr. Broiles. It is his contention that much needless expense is ordinarily entailed in doing this work and that suitable equipment would solve the problem. In the building of the International Electric & Machinery Company a system of overhead tracks and hydraulic trucks is employed to facilitate the handling of heavy motors. When a motor is received at the rear entrance it is picked up by a 3-ton crane, operated by one man, and is then transferred to a removable truck platform. This platform is then loaded onto a hydraulic truck and delivered to the inspection department. When it is necessary to deliver the motor to the electrical department, the platform on which the motor stands is placed on the truck, and by means of the hydraulic elevator is taken to the second floor. The motor and the removable truck platform are not separated until the motor is ready for delivery. For moving motors between the rear of the first floor and the display room an overhead track system has been installed.

The company has also devoted much attention to its sales force. As the concern carries a line of crushers, mills, air compressor units, pumps, generator sets, pulleys and belting the salesman on approaching the customer does not limit his sales talk to motors. When it is determined just what the customer intends to do with the equipment, this information is turned over to the company's engineering department. This department recommends the type of equipment best suited to the work. This service has been greatly appreciated by customers of the company who find that the expert advice often saves them money in addition to supplying them with the right equipment.

Electrical department which is divided into sections for various classes of repair work.

Selling Appliances for Use Every Day in the Year

Valley Electrical Supply Company Places 736 Percolators in Fresno Homes in Two-Week Sales Campaign

The electric iron has been considered a necessity in the American home for some time. It is purchased and replaced or repaired from time to time as the occasion demands. As the real utility of it is appreciated fully by the housewife and as the appliance is so very popular, H. H. Courtright, manager of the Valley Electrical Supply Company, Fresno, Calif., believes that in the San Joaquin Valley the market for the electric iron is nearer the saturation point than it is for any other household electric appliance.

In arriving at this conclusion, the company endeavored to analyze the sale of other appliances from their various angles to determine just what it would mean from a load-building standpoint. In analyzing the sales, which are made ordinarily over the counter, the conclusion was reached that a large majority of these appliances, owing to the price and their appearance, on entering the home, were placed on the shelf or in the buffet. The housewife hesitated to use them promiscuously as she found it necessary each time to spend a great deal of time and effort in cleaning and polishing them before they were in shape to go back on display again.

This meant that the appliances were used but once or twice a month, and therefore were not of real service to the housewife. Likewise, they were not the source of revenue to the power company that they should be. After reaching this conclusion, it was decided that an appliance, to be of real value to the power company from a revenue standpoint, must necessarily be less expensive and not so fine in appearance that it would become an article of decoration rather than one of utility.

The company kept in mind that in picking an appliance which would meet this requirement it must be of unquestionable quality before the merchant or the power company could afford to stake a recognized reputation on it. In picking a percolator for the campaign it was decided that if the price could be kept around \$5 and the appliance at this price offered to the customer on very liberal terms, it would quite materially increase the field from which the Valley Electrical Supply Company could expect to draw its prospects. The 8-cup percolator made by the Russell Electric Company was the one to be featured in the campaign.

In putting on this campaign it was planned that all sales should be handled by the company's normal sales force from its retail store, using no house-to-house salesmen, but depending entirely on direct by mail and newspaper advertising. These points having been decided, a quota was set, which was based on 5 per cent of the residence lighting consumers in the particular district where the sale was to be staged. The quota which was assigned on this basis was 734 percolators.

One of the display windows used to attract attention to the offer that the company would allow the purchaser \$1 for an old coffee pot.

The advertising program as laid out consisted of a combination of direct by mail and newspaper display. A broadside, 12x21 in., printed in two colors, was mailed to each of the 14,000 lighting consumers on the Friday preceding the opening date of the sale. On Saturday evening and Sunday morning prior to the opening, there appeared a 5-column 21-in. announcement advertisement in the two leading newspapers, and in addition to this there appeared in the morning and evening papers, alternately, a reasonably good-sized advertisement. This, of course, kept the sale before the public every day.

Three days before the closing, the advertising took on the tone of a closing announcement, and the Friday night preceding and the Saturday morning of the closing day, there appeared a 5-column 21-in. advertisement as a final announcement. All of this publicity hammered away on the feature of the \$1 allowance for the customer's old coffee pot on the purchase price of the percolator at \$5.75, the balance of \$4.75 to be paid \$1 down and \$1.25 per month.

When the sale closed on Saturday night, the count showed that 736 percolators had been disposed of in the two weeks' campaign. Twenty-six per cent of the sales had been made for cash and the balance on a terms contract. After the campaign had been closed, Mr. Courtright stated that he was confident that a large percentage of these appliances was sold to people who had never owned an electric percolator and in all probability never would have owned one were they forced to buy the

The broadside shown was mailed to all residential customers of the San Joaquin Light & Power Corporation.

more expensive percolators and pay cash for them. This contention is further substantiated in making a check of the old coffee pots which were turned in, fully 90 per cent of which were the old-style gas percolators of the less expensive type.

Sales of the higher class and more expensive percolators also increased during this time. The appliance business in general was increased quite materially.

The 700 old pots which are shown in the photograph were each damaged by punching a hole in the bottom so that they could not be used again. The entire lot was sold as scrap metal to a junk dealer.

In conducting the campaign the Valley Electrical Supply Company was assisted by W. H. Carter and P. W. McCanley, Pacific Coast representatives for the Russell Electric Company.

Attractive lamp window display of the New State Electric Supply & Fixture Company, Phoenix, Ariz. Lamps, with eyes, mouth and other features painted on them, were used to form heads for the dolls seen in the display.

SOME TALL RESOLUTING

By Joe Osier

Now is the time for the boys in business to crochet some New Year resolutions to replace the frayed promises made when John '24, deceased, was a sprout.

To assist them in their task, I offer the following suggestions, snapped out when I was feeling particularly well pleased and possessed:

1—During the coming year, I shall not hide my light under the fabled bushel, but shall advertise my shop, my business, my wares and my services as much as my means will permit.

2—I shall use my display windows, dress up my shop, make my place of business as attractive as a bevy of bathing beauties.

3—I shall give service to my customers. The best will be just right for them. I shall give them what I promise when I promise it and their wishes shall be may orders. "Yes" will mean "yes" on my premises, and "maybes" will not be tolerated.

4—I shall not argue with customers. If they insist on controversy, I shall direct them to the corner cop. I shall smile at their bleating and "sorry, sir," them out of the league.

5—I shall not cut prices. Even though I lose a million sales, I shall not drop a dime nor slice a cent. One price—the right price—shall obtain.

6—I shall beat the bushes for business and not wait for it to trickle in. When there is a race on, I shall be among the starters. And, in case I am left at the post, I shall not squeal, squirm nor squawk.

7—I shall make my collections. Yea, verily, I shall gather into my till the tin that is my due. And, in case this is not humanly possible, I shall not throw good glue after bad.

8—I shall boost my business—the electrical industry—every day in every way. I shall be a press agent and, if necessary, I shall clamber to the roof tops and broadcast my message.

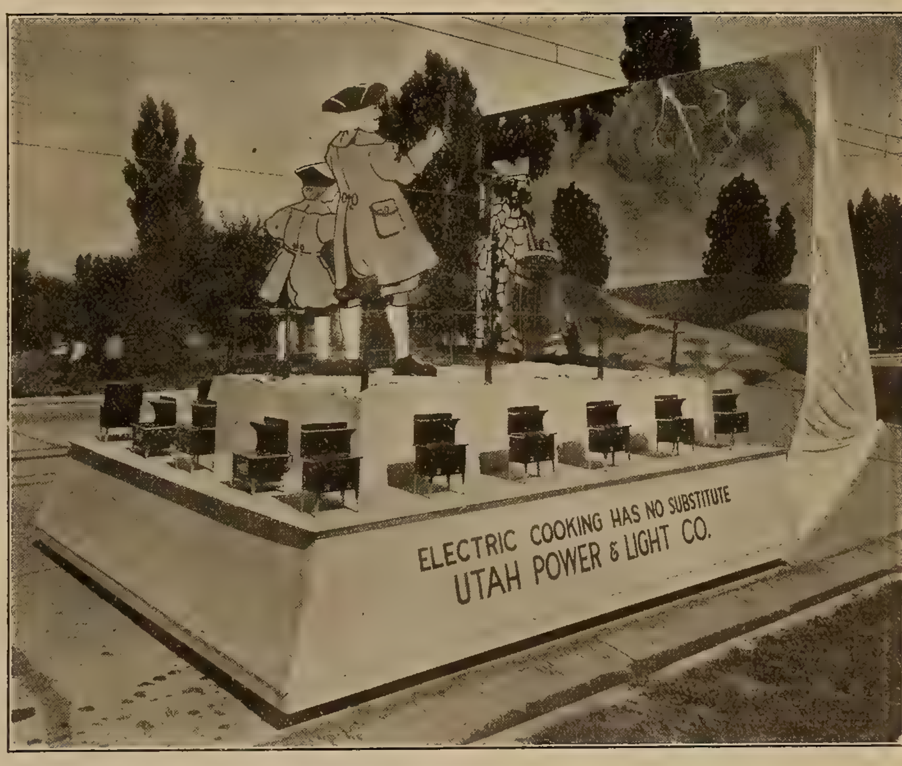
9—I shall study my business—keep up with the parade—know what it is all about. This done, I know I need have no fear of blind alleys or pits which are digged for and by the ignorant.

10—I shall not roll my hoop with double-crossers nor double-dealers.

High Tension and Low Voltage.

When the party gets rough, I'll honk home; the plot will thicken without me.

11—I shall not knock my competitors. I shall seek their society—eat with them, play with them, help them. I shall do everything in my power to win and hold their friendship. And I'll never cross my fingers when with them and uncross them when their forms are removed.



The Utah Power & Light Company's float in the centennial celebration held at Logan, Utah. This celebration was held in commemoration of the arrival of the pioneers in Cache Valley, Utah. The parade was an exceedingly spectacular affair, featuring the development of the territory from the advent of the famous Jim Bridger up to the present time. The power company's float was designed to depict the evolution of electricity from Benjamin Franklin's time down to the present. This float was one of the most interesting and attractive in the parade.

NEWS OF THE INDUSTRY

Water and Power Act Loses by Majority of 431,602 Votes

Amendment No. 16, the California Water and Power Act, lost by a majority of 431,602 votes, according to the official tabulation just released by Frank C. Jordan, secretary of state, Sacramento, Calif. The final count showed that the measure received 751,985 noes and 320,383 ayes. This compares with 597,453 noes and 243,604 ayes in 1922.

In the two-year interim between the elections in which the measure appeared on the ballot the noes gained 154,532 votes while the ayes gained 76,779 votes. The ratio against the measure was 2.45 votes to one in 1922 as compared with 2.34 to one in 1924.

The measure carried in but two counties in the state, Plumas and Sacramento. In the former the majority was but 5 in favor of the act while in Sacramento it was 1,427. The vote against the act was especially heavy in southern California, where in some counties a vote of 4 to 1 was polled against it.

The official vote by counties for 1924 follows (for 1922 official vote see Journal of Electricity, Nov. 15, 1924, page 376):

Votes For and Against the Water and Power Act by Counties in California—1924.

County.	Yes.	No.
Alameda	36,251	75,746
Alpine	5	32
Amador	476	1,280
Butte	3,864	5,504
Calaveras	658	1,306
Colusa	577	1,780
Contra Costa	4,701	9,552
Del Norte	207	363
El Dorado	1,079	1,361
Fresno	10,596	20,279
Glenn	1,097	1,963
Humboldt	2,646	7,547
Imperial	1,699	2,988
Inyo	453	1,077
Kern	4,495	10,953
Kings	984	3,824
Lake	445	1,201
Lassen	661	1,180
Los Angeles	90,611	285,527
Madera	1,210	1,684
Marin	2,811	6,734
Mariposa	219	434
Mendocino	1,018	3,771
Merced	1,733	3,825
Modoc	233	962
Mono	66	129
Monterey	1,457	4,933
Napa	1,444	4,250
Nevada	1,070	2,283
Orange	5,069	19,119
Placer	2,518	2,994
Plumas	588	583
Riverside	2,952	10,156
Sacramento	14,907	13,480
San Benito	563	1,364
San Bernardino	5,029	18,295
San Diego	14,439	22,729
San Francisco	49,093	76,604
San Joaquin	5,841	13,981
San Luis Obispo	1,636	4,825
San Mateo	4,242	8,397
Santa Barbara	2,317	8,646
Santa Clara	10,194	21,151
Santa Cruz	2,043	4,873
Shasta	1,326	3,031
Sierra	215	329
Siskiyou	1,813	3,171
Solano	3,476	5,284
Sonoma	3,340	12,039
Stanislaus	3,224	8,976
Sutter	1,018	1,931
Tehama	1,358	2,462
Trinity	226	626
Tulare	5,028	11,350
Tuolumne	1,089	1,601
Ventura	1,308	6,173
Yolo	1,626	3,167
Yuba	1,139	2,182
Totals	320,383	751,985

Steel Mill at Pueblo, Colo., Will Be Completely Electrified

The Colorado Fuel & Iron Company will spend $3,500,000 during 1925 on the electrification of its Pueblo, Colo., plant, according to a recent announcement by officials of the concern. The improvement program includes the installation of seven 1,200-hp. boilers burning blast-furnace gases and powdered coal. Turbo-generators having a capacity of 6,000 kw. will be installed in a new power house.

Electric power will be used for driving the rod mill, the 10-in. mill, 12- and 14-in. merchant mills and the rail mill. These mills are all steam-driven at present. The new equipment will also include several Cottrell precipitators for cleaning the blast-furnace gases.

The company has just completed the installation of two 20-ton electric cranes fitted with electro-magnets for loading steel rails. Electric welding equipment has also been installed in the finishing department for reclaiming slightly defective steel products.

Bids on Transmission Line Material Awarded in Tacoma.—The city of Tacoma, Wash., has awarded contracts amounting to nearly $65,000 for materials to be used on the Lake Cushman-Tacoma transmission line, as follows: Western Electric Company, pole line hardware, $8,501; Washington Machinery Company, Tacoma, guying cable, $8,347; Pacific States Electric Company, Tacoma, insulators, $39,551; Ohio Brass Company, Tacoma, insulator hardware, $8,156. All bids for wired wireless telephone equipment between Tacoma and Cushman were rejected as excessive.

Smiles Contest Winners to Be Announced Jan. 15

Announcement of the winners in the Courteous Service Club's "Smiles Contest" has been postponed until Jan. 15, according to R. A. Balzari, chairman of the club. The judges are experiencing difficulty in selecting the six prize winners from among the 185 slogans which were submitted in the contest.

Anacortes Property Is Purchased By Puget Sound Company

The executive department of the Puget Sound Power & Light Company, Seattle, has announced recently the purchase of the system of the Washington Power, Light & Water Company, Anacortes, Wash., formerly owned and operated by Douglass Allmond. The property purchased consists of a 500-kw. Curtis steam turbo-generator unit and the distributing system in Anacortes. The water system of the Anacortes company was not included in the purchase.

In order to serve the new property more adequately, a 55,000-volt transmission line was built by the purchasing company from Burlington, Wash., a distance of 18½ miles, and a 1,000-kw. substation was installed at Anacortes. The old steam plant will be kept in operating condition for reserve and emergency power.

The new property lies naturally in the northern district of the Puget Sound Power & Light Company, and will be operated by H. B. Sewall, manager of that district, from his headquarters in Bellingham, Wash. The rates that became effective in Anacortes with the official transfer of the property are the same as other rates in similar towns served by the Puget Sound company, and represent a substantial reduction from the rates formerly charged by the old company.

Fageol Motors Company Develops Gas-Electric Type Bus

Using General Electric Company generators and motors, the Fageol Motors Company, Oakland, Calif., has been developing a design for a gas-electric motor bus and has recently received from one of the larger traction companies in the State of New York an order for the first fleet of these new gas-electric Fageol coaches.

The advantages anticipated in the gas-electric bus are of importance chiefly in city service and are expected to justify the higher first cost. They are expected to include lessened maintenance costs of power transmission equipment; smoother operation on account of the elimination of gear shifting; lessened mechanical strains within the chassis and consequent longer life of both chassis and engine, because of elimination of gear shifting; a higher rate of acceleration, which will increase schedules and thereby cut down the cost per mile. Experiments have already shown that the gas-electric system decreases the number of engine revolutions per mile by from 10 to 20 per cent, and this is another very important factor in lengthening the life of the vehicle.

Washington Company Constructs New Transmission Lines

During the past six months The Washington Water Power Company of Spokane has been executing a program of transmission-line construction which will cost $2,000,000 when completed. The new work is strictly in the nature of betterments and improvements, affecting only communities already served, but at the same time enabling the company to take on prospective increases in load.

Nearly three years ago 60-kv. transmission lines were built into Grant County in order to serve an agricultural district that needed power for irrigation pumping. Later on 60-kv. lines were built into Okanogan County, and a year ago a new line was built from Lind to Colfax in order to complete a ring to serve the productive wheat area known as the Palouse Country.

One of the very important lines of the company is that known as the Intermountain line, which extends from Long Lake to Taunton. This is 110 kv. and supplies electricity for the entire Cascade Division of the Chicago, Milwaukee & St. Paul Railway. In order to protect this business, and as an important portion of the future 110-kv. ring system, an entirely separate 110-kv. line was planned, to connect Taunton with Long Lake. A portion of this about eighty miles long, between Long Lake and Stratford, has been completed, and the lower portion from Neppel to Taunton, about twenty-five miles in length, was built in the spring of 1924. The present 60-kv. line between Stratford and Neppel, about twenty miles long, is to be rebuilt for 110 kv., thus completing the new line, which will be 125 miles long.

The two important generating plants at Long Lake and Little Falls have been tied in with Spokane with one 60-kv. double-circuit transmission line. A new 110-kv. line has just been built between Long Lake and East Spokane, where the new East Side substation is now under construction. This new line is about thirty miles long.

The old Palouse line of 60 kv., built in 1902, between Spokane and Tekoa, has been rebuilt. This is insulated now for 60 kv., but will be changed over to 110 kv. whenever the portion of the Chicago, Milwaukee & St. Paul Railway east of Taunton is electrified. This line will then be tied in at the East Side substation with the new 110-kv. Long Lake-Spokane line. The Palouse line is forty-one miles long.

Except for those portions of the Palouse line which are located on highways where single poles are installed, all of the newly constructed lines are of two-pole construction, with 50-ft., butt-treated cedar poles, placed on 10-ft. centers and set 8 ft. in the ground. Cross-arms are ·22 ft. long. Two 5/16-in. ground wires are used above the crossarms for the double purpose of strengthening the line and protecting it against lightning. Porcelain suspension type insulators 5 ft. long, with six units, are used, and the conductors are seven-stranded No. 8 copper.

Work on the Long Lake-Taunton line will probably be completed before next spring. On the whole program four construction crews with permanent central camps have been used outside of Spokane. The work has been under the general direction of B. M. Merrill, superintendent of light and power, with A. E. Beckwith, assistant superintendent, directly in charge. Plans were made by the engineering department under direction of V. H. Greisser, chief engineer. The foremen in charge of the outside work are George Messenger and Charles Kimball, who have built the Long Lake-Spokane and the Spokane-Tekoa lines; C. O. Myers and P. Hobbs, who have been in charge of the Long-Lake-Stratford line.

In addition to the outside work, a great many improvements have been made in Spokane, including ten miles of 13-kv. distribution lines, a 13-kv. double-circuit line between East Side substation and Post Street substation, and a 13-kv. line from East Side substation to Hillyard. The new East Side substation has three 6,667-kva. single-phase transformers and one spare. The Long Lake-Spokane line, though built for 110 kv., will be operated at 60 kv. until such time that it becomes necessary to raise the Spokane-Tekoa line from 60 kv. to 110 kv. The East Side substation will therefore be operated for the present at 60 kv., but the same transformers can also be operated at 110 kv. when necessary. The secondary voltage is 13,000 for local distribution. The work in Spokane has been handled by C. W. Miller, foreman of the line department.

Stringing cables on new transmission lines of The Washington Water Power Company. Pole construction may be seen in background.

Electrical Equipment Exhibit Is Held in Los Angeles

The first annual Convention-Exhibit of Electrical Equipment was held at the Biltmore Hotel, Los Angeles, Calif., under the auspices of the Commercial Board of that city. This was the second of a series of convention-exhibits which has been held by the Commercial Board, a civic organization composed of members of the large wholesale, retail and manufacturing concerns of the city and interested only in promoting the best interests of business.

The exposition, which comprised industrial displays, electrical fixtures, appliances and devices and radio exhibits, was open to the public throughout the day from 9 o'clock until 5. Among some of the electrical firms of Los Angeles and southern California that had exhibits were the Southern California Edison Company, Pacific States Electric Company, Illinois Electric Company, Safety Electric Products Corporation, Reiman Wholesale Electric Company, Fairbanks-Morse Electric Company, Schleuter's, E-Z Housekeeping Shop, Gilfillan Bros., Electric Products Corporation, Monarch Electric Company, Rhode Eckles Electric Manufacturing Company, Inc., Fitzgerald Music Company, Southern California Music Company, Dupont Household Appliance Company, Canavan Motors Corporation, Leroy C. Bishop, Electric Lighting Supply Company, Angelus Lighting & Fixture Company, Everhot Electric & Manufacturing Company, Woodill & Hulse Electric Company, Carbon Electric Sales Agency, Ex-Service Men's Sales Agency and the United Cooperative Industries.

A feature of the exhibition was the luncheon served in the main ballroom of the hotel. Over three hundred were present, including prominent members of the electrical industry and the entire membership of the Commercial Board of Los Angeles. Walter G. Blossom of the Southern California Edison Company delivered the principal address, his subject being "The Romance of Electricity." A motion picture film showing the progress of the electrical industry in California from the time of its introduction was used to illustrate the speech.

Applications for Water Appropriation Permits.—The Nevada Irrigation District, Grass Valley, Calif., has filed with the California Department of Public Works, Division of Water Rights, two applications for permission to divert from the South Fork of the Yuba River 135 sec.-ft. and 126 sec.-ft., respectively, for the generation of hydroelectric energy.

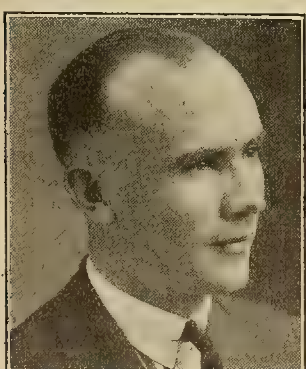
Insull Medal Awarded to Two Utah Power Employees

Award of the Insull medal for successful application of the Schaefer or prone pressure method of resuscitation from electric shock has been made to two employees of the Utah Power & Light Company, Salt Lake City, Utah. These men, Orville D. Lund, distribution lineman, and Lee York, transmission line patrolman, saved the life of a fellow employee, Frank Hickenlooper, on May 6, 1924.

The accident occurred when Mr. Hickenlooper and Mr. Lund were stringing wires under the 11,000-volt lines

ORVILLE D. LUND

near Brigham City, Utah. They were pulling up slack in the wire preparatory to ceasing work for the day, Mr. Lund being on the pole and Mr. Hickenlooper on the ground. In some manner the wire caught on a rock, and when it dislodged it flew up and came in contact with the 11,000-volt line. When the



LEE YORK

flash came Mr. Hickenlooper was standing in the midst of three or four coils of wire, which extended over a wire fence to the reel stand. He was rendered unconscious and became entangled in the wires, with sparks shooting all around him as the current was transmitted through his body. Mr. Lund immediately descended the pole and grasped his fuse stick, and at imminent risk of his own life succeeded in releasing Mr. Hickenlooper, who at that time was apparently lifeless. After a fruitless attempt to resuscitate the victim by forcing air into his lungs with the mouth-to-mouth process, Mr. Lund called to Mr. York, who happened to be near, and they immediately began to apply the prone pressure method of resuscitation. The two men worked unceasingly for twenty minutes, restoring respiration and bringing Mr. Hickenlooper back to life. A doctor was summoned, who rendered first aid and had the victim removed to a hospital. Mr. Hickenlooper fully recovered and resumed his duties in the distribution department of the Utah Power & Light Company in its Ogden division.

The presentation of the Insull medals and certificates was made by Markham Cheever, general superintendent and chief engineer of the power company, at a recent conference of division superintendents and foremen of that company held at Salt Lake City.

First Automatic Substation in Seattle Is Installed

The first automatic substation to be installed in the city of Seattle, Wash., is the Pasadena Place station recently put in service by the Puget Sound Power & Light Company of that city. This station, which serves a district in the eastern part of the community ,contains two banks of 1,500-kw. capacity each, one being a spare, and the necessary switching equipment for five 4,000-volt secondary circuits radiating from it. The equipment is of General Electric Company manufacture, and all the latest practical features of automatic control are embodied in it.

Current is fed to the primary bus of the station by either one of two 13,000-volt lines so controlled that if the line that is in operation fails, the other is automatically cut in. As the load on the station builds up to a point where the capacity of one of the 1,500-kw. banks is exceeded, the spare bank is automatically cut in and the total load is divided between the two. Then, when the load decreases to less than 1,500 kw., the spare is cut out. Each secondary circuit is provided with a switch that, in case of a short or ground on that circuit, automatically opens and closes three times before remaining open. Thus a swinging or temporary short can cause an outage of only a few seconds' duration.

Space is provided in the station for a third bank of 1,500-kw. capacity to be installed when load conditions demand it. Other stations of similar operation and control are contemplated for Seattle by the Puget Sound company.

To Build Steam Plant at Colorado Springs, Colo.—Announcement has been made by A. E. Carlton, president of the Golden Cycle Milling & Reduction Company of Colorado Springs, Colo., that within the next few months that company will erect a 1,500-kw. steam plant at its mill in that city. The plant will burn coal and will be equipped with automatic stokers. The estimated cost is $75,000.

Puget Sound Company Holds Get-Together Meeting.—The Puget Sound Power & Light Company, Everett, Wash., recently entertained its employees with a "get together and get acquainted with your fellow employee" party. The evening was spent in dancing and playing cards, and refreshments were served.

Court Sustains Idaho Company in Complaint Filing

Citing a decision of the United States Supreme Court as a precedent, Judge F. S. Dietrich, of the Federal District Court for Idaho, has overruled a motion made by A. H. Conner, attorney-general, to dismiss the bill of complaint recently filed by the Idaho Power Company, Boise, Idaho, for the purpose of effecting a complete review of valuation and rate decisions handed down by the Idaho Public Utilities Commission. (Journal of Electricity, Aug. 1, 1924, p. 105, and Aug. 15, 1924, p. 142.)

Because the Idaho Power Company had not requested a rehearing before the commission, the attorney-general insisted that the company had not exhausted its so-called legislative remedy, and that no appeal could be taken to the courts until such rehearing had been demanded and acted upon by the commission. Judge Dietrich, however, definitely disposed of this contention in his opinion, stating that the Federal Court should take jurisdiction under the circumstances presented.

The state is expected to file its answer to the complaint in the near future, but trial of the issues involved probably will not take place until some time in the coming spring.

Changes Made in Organization of Reclamation Bureau

Effective Jan. 1, 1925, certain changes will be made in the organization of the Bureau of Reclamation, Department of the Interior. The headquarters of the bureau have been at Denver, Colo., for some time.

Under the reorganization the chief engineer, who will report to the commissioner of the bureau, will have charge of all matters relating to the engineering investigation, construction, operation and maintenance of the projects and of all employees of the Denver office, with the exception of the director of reclamation economics and his force and of the legal staff maintained at that point.

Superintendents will have charge of all work connected with the construction and operation of their respective projects, including the execution of all contracts which under present regulations are executed on the projects, and of all employees except the general counsel and force. Superintendents will report to the chief engineer.

The position of office manager will be abolished and the title of the incumbent changed to that of chief clerk, who will perform the usual duties of that position and report to the chief engineer.

The director of reclamation economics will have charge of the investigation of economic problems connected with the development of existing or proposed reclamation projects, including the classification and settlement of land and the improvement of the industrial, agricultural and social conditions of settlers. He will also have charge of the activities of the bureau looking to cooperation with agencies designed to promote improvements in agriculture and in cooperative organization of communities. He will report to the commissioner of the bureau under whose supervision the work of the officials mentioned is done.

Fleet of C-T electric trucks recently purchased by the American Railway Express for delivery service in Oakland, Calif.

American Express Buys Electric Trucks for Oakland

The recent installation by the American Railway Express Company in its Oakland, Calif., delivery service of thirteen C-T electric trucks marks a forward step in the development of electric transportation in the San Francisco Bay territory. That this purchase is not experimental is shown by the fact that the American Railway Express Company today operates more than 1,500 electric street trucks throughout the United States. This company is doubtless the largest individual user of transportation equipment, and in the territory affected the inauguration of this initial fleet of thirteen trucks, which, it is reported, will be materially increased during the year 1925, will undoubtedly establish an example that will be emulated by many other users of transportation.

Independent of the saving in operating costs (which the president of the American Railway Express Company states is approximately 50 per cent of the cost of the upkeep of a gas truck), the adoption of the electric truck by the American Railway Express Company in Oakland will probably upset some preconceived ideas as to the economy of horse-drawn vehicles. It is interesting, therefore, to note that while ten of the thirteen electric trucks will replace a like number of gas trucks, the remaining three trucks will replace five double-horse wagons.

These thirteen electric trucks will be garaged in the space formerly used for storing wagons, an area of 4,638 sq.ft., and will enable the leasing or other disposition of 14,343 sq.ft. formerly used for provender, horse stalls and corral. The transition from horse-drawn wagons to electric trucks will enable a reduction of two out of five drivers and will also eliminate a stable man.

Public Service Company of Colorado to Merchandise Radio.—Radio departments have been established by the new business department of the Public Service Company of Colorado in the principal towns which formerly made up the western division of the company. Splendid success in radio merchandising is already reported as having been met at Boulder, Loveland and Fort Collins, Colo., and at Cheyenne, Wyo. According to G. B. Buck, in charge of all commercial electric activities, the continuing success of those towns will in a major degree determine whether or not similar activity will be started in other towns, including Denver.

World's Largest Express Service Buys Electric Truck Fleet

Service First!
1---Best Service
2---No Delays
3---Always on the Job
4---Maximum Safety
5---Traffic Asset

American Railway Express Company Perfects Delivery Service In Oakland Area

Why Electrics?
1---Dependability
2---Economy
3---Simplicity
4---Longest Life
5---Lowest Upkeep

The problem of transportation to many institutions is viewed only as incidental to the merchandising of products, or in other words as a necessary evil.

Not so however with the American Railway Express Company whose very business success is dependent upon the best transportation and who must render a reliable service to its patrons at the lowest possible cost

The world wide experience of the American Railway Express Company under all conditions has conclusively proven to them that the electric truck is the supreme unit for delivery where short hauls and frequent stops are encountered.

Today the American Railway Express Company is operating more than 1,500 electric street trucks in the United States and has made an initial purchase of twelve electric trucks for the purpose of rendering to its customers in Oakland and Alameda dependable service.

C-T ELECTRIC TRUCKS
SOLD BY
COMMERCIAL TRUCK CO.
San Francisco

Equipped with Exide Ironclad Storage Batteries
Supplied by the
Electric Storage Battery Company
San Francisco

Pacific Service Provides
Electric Energy for This Fleet.

SEE THESE TRUCKS ON PARADE AT 10 A. M. TOMORROW
"ELECTRIC FLEETS FOR CITY STREETS"

Advertisement used to announce that the American Railway Express Company had placed twelve electric trucks in service in Oakland, Calif.

Cooperative Program Planned by Industrial Truck Makers

At a meeting held at the general offices of the Society for Electrical Development in New York City recently, the manufacturers of electric industrial trucks undertook a cooperative business-building program in conjunction with the manufacturers of storage batteries and the society. These companies, already members of the society, have appropriated a special fund for the purpose of selling the idea of electric industrial trucks for the handling of materials.

Among the companies participating in this program are: Automatic Transportation Company, the Baker R. & L. Company, Cowan Truck Company, Crescent Truck Company, Edison Storage Battery Company, Electric Storage Battery Company, Eleveyor Electric Industrial Truck Company, Elwell-Parker Electric Company, Lakewood Engineering Company, Mercury Manufacturing Company, Yale & Towne Manufacturing Company. The following advisory committee was appointed to direct the activity: R. W. Chandler, Yale & Towne Manufacturing Company, chairman; R. G. Zindle, Society for Electrical Development, secretary; W. Van C. Brandt, Electric Storage Battery Company; C. B. Cook, Elwell-Parker Electric Company, and M. A. Watterson, Baker R. & L. Company.

This plan will be operated along lines similar to the method of conducting a number of other commodity programs which have been instituted by the Society for Electrical Development, in the interest of special groups. Among these other groups, within the industry, which are already participating in similar cooperative promotional programs, are the manufacturers of electric street trucks, batteries and accessories and electric fan manufacturers. Plans for additional commodity programs with other groups are still in the formative stage.

Southern Sierras Power Company Denied Temporary Rate Increase.—The California Railroad Commission has denied the application of the Southern Sierras Power Company for a temporary increase of rates to compensate that company for increased cost of operations due to drought conditions. The company estimated that for the 16-month period from Jan. 1, 1924, to May 1, 1925, its operating costs will have been increased $743,000 more than it would have had to spend had the normal amount of water power been available.

Puget Sound Power & Light Company Plans Additional Capacity in Eastern Washington.—The Puget Sound Power & Light Company, Seattle, Wash., plans an expenditure of approximately $75,000 in the enlargement and extension of its generating plant at Dryden, near Wenatchee, to increase the capacity of the unit from 1,600 to 3,100 hp. The improvement provides for enlarging the present power house, increasing canal capacity, installing concrete spillway, new penstock and additional generating equipment. Permanent headgates, costing $15,000, have already been installed.

Division Superintendents and Foremen Hold Conference

The annual conference of division superintendents and foremen of the Utah Power & Light Company, Salt Lake City, Utah, held at the general offices of that company Dec. 15 and 16, was attended by approximately fifty men from various points on the company's system in Utah, Idaho, Colorado and Wyoming.

While the keynote of the meetings was largely along "Safety First" lines, considerable stress was laid on general efficiency and the maintaining of first-class service. Some of the subjects discussed were:

The work of the purchasing department; past year activities in the Western Colorado Power Company; safety discussion (Each division superintendent reviewed the accidents which occurred in his division during the past two years and discussed the means by which each accident could have been avoided); right of way matters; tree trimming; distribution maps and division data books; entrance switch practice; meter records and installations; grounding secondary circuits; discussion of guy anchors, including the newest developments in patent anchors; radio; fuses and pole-type automatic switches.

One of the principal features of the conference was the presentation of Insull medals to Orville Lund and Lee York, employees of the company, in recognition of their saving the life of a fellow employee last May by the successful application of the Schaefer or prone pressure method of resuscitation from electric shock. Markham Cheever, general superintendent and chief engineer of the company, made the presentation of the medals and certificates.

Southern California University To Teach Illumination

Through the efforts of the electrical industry, under the direction of Clark Baker, of the National Lamp Works of the General Electric Company, Oakland, Calif., arrangements have been made with the officials of the University of Southern California to give fitting attention to the matter of illumination. With the cooperation of Emery H. Olson, director of the Metropolitan College of the University, a twelve weeks' course has been prepared and will be offered to the students of that institution beginning Feb. 1, 1925. The course has been prepared by Mr. Baker and others of the electrical industry and will be thoroughly practical rather than merely theoretical. This will insure the imparting of information that will be beneficial to the industry and will give the student concrete information on illumination practice.

The opening of this course comes at a particularly opportune time, as it will immediately follow the lighting school to be held in Los Angeles, Calif., during the two weeks starting Jan. 19, 1925, under the auspices of the Pacific Coast Electrical Association. The instructors at this school will be men from the electrical industry of Southern California.

Utility Associations Hold Joint Conference in Denver

The second annual one-day joint conference of the Colorado Public Service Association and the Rocky Mountain division, N.E.L.A., was held in Denver, Colo., Dec. 18, with an attendance of over a hundred utility men representing the principal companies in the region.

A departure from the customary program was the allowance made for discussion, which provided opportunity for many speakers who ordinarily do not take part in regular convention programs. Specific subjects were discussed, and one of the features of this part of the conference was the appearance of two representative Denver high school students who talked from the angle of the contestants in the recent Home-Lighting Essay contest.

The ever-present theme of better public relations found its place on the program in the report of Miss Inez Thompson of the Public Service Company of Colorado, Denver, Colo., chairman of the women's public information committee in the Mountain region.

The committees which arranged the conference were headed by W. P. Southard, general manager, Trinidad Electric Transmission, Railway & Gas Company, Trinidad, Colo.; J. E. Loiseau, secretary, Public Service Company of Colorado, Denver, Colo., and S. W. Bishop, executive manager, Electrical Cooperative League, Denver. The Wyoming Utility Association and the New Mexico Electrical Association also participated in the conference.

Street warning sign used by the Pacific Gas and Electric Company to replace the customary "Men at Work" barrier. The sign has appealed to motorists, and, as a San Francisco newspaper remarks, "Who could be angry at a 'Sign of Progress?'"

Denver Broadcasting Station Goes on the Air

KOA, the latest link in the chain of General Electric Company radio broadcasting stations, has been completed, and the first program of the new station in Denver, Colo., was broadcast Dec. 15. Housing and equipment costing nearly $200,000 have gone into this new station, which by many experts is regarded as one of the most modern in the country. Although H. D. Randall, manager of the company in the Rocky Mountain district and the individual chiefly responsible for the final approval of Denver as the site for the station, was not able to take part in the finishing touches of the station owing to serious illness, his name is being given primary mention in the achievement.

Harry Sadenwater, chief radio engineer of the General Electric Company, has spent the last few months in Denver supervising the work and completion of the plant in Mr. Randall's absence. It is believed he will continue with the management. Rollin Hagar, head of the company's program department, is directing that activity pending the appointment of a Denver man to the position. Frank U. McEniry, formerly field representative of the Electrical Cooperative League in that city, has charge of the news bureau.

Martin P. Rice, manager of the publicity department of the company, is in Denver attendant upon the opening of the station. Various civic organizations, city and state officials and the Electrical Cooperative League, of which Mr. Randall is chairman, are all assisting in the opening of the station.

Colorado River Basin Surveys Supply Valuable Data

From time to time since 1869, when Major J. W. Powell first explored the Grand Canyon of the Colorado River, the U. S. Geological Survey has been making surveys in parts of the 244,000 sq.mi. drained by that river. Systematic surveys for a series of large-scale maps of the river and adjacent areas were begun in 1909, and the field work for these maps is now practically completed. The maps prepared and the information collected by the Geological Survey furnish an accurate knowledge of nearly 2,000 miles of the water courses in this basin, showing turn of every stream, the location and the fall of all rapids, the topography and geology of the canyon walls, and the location and cross sections of the more feasible dam sites.

Some of these maps have been included in books; others are published separately in sets. Water-Supply Paper 396, "Profile Surveys in the Colorado River Basin in Wyoming, Utah, Colorado and New Mexico," contains forty-three maps showing plans and profiles of the Colorado above Green River, of Green River and its tributaries, and of a part of Gila River. The following maps have already been published: Green River from Green River, Utah, to Green River, Wyo., 16 sheets; Colorado River from Lees Ferry, Ariz., to mouth of Green River, Utah, and San Juan River to Chinle Creek, Utah, 22 sheets; price 10 cents each.

Stream gaging has been in progress on the Colorado River since 1895, and seventy-seven gaging stations are now regularly maintained in its basin. The measurements thus made are published annually in the Geological Survey's series of reports on surface water supply. Copies of Water-Supply Paper 395, "Colorado River and Its Utilization," are still obtainable, and three other reports are now in preparation that will show how much water is available in the basin and will contain suggestions as to its best use.

Port of Kalama Files on Two Power Project Sites

Two applications, each covering the appropriation of 20 sec.-ft. of water from different points on the Kalama River, have been filed with Marvin Chase, Washington supervisor of hydraulics, by the Port of Kalama, Cowlitz County, Wash. The port purposes to develop hydroelectric power at one generating plant, the proposal being to convey water from the two sites through two pipe lines which would converge a short distance from the power house.

The applications of the Port of Kalama are understood to be tentative, as several other applications had been filed previously by the body. Port officials have stated that they will eventually determine upon the most feasible site.

Tacoma's New Municipal Substation for Cushman Project Is Announced.—Plans and specifications for the proposed $250,000 substation for the Lake Cushman power project under construction by the city of Tacoma, Wash., have been completed, and bids are expected to be opened by the first of the year. The substation will be the Tacoma terminal of all transmission lines from the new Cushman hydroelectric plant. The building and equipment will cover a site two blocks square, bordered by North Nineteenth, Twenty-first, Washington and Adams Streets, and with equipment will represent an investment of $550,000, when completed, which, it is expected, will be in about twelve months. The building will be of concrete, three stories high. Equipment will include switchboards valued at $80,000, and twelve truck-type circuit breakers, each so mounted that it can be used interchangeably. Outdoor equipment of the plant will weigh approximately 753 tons.

Denver Company Increases Office Personnel and Space

Increase of activities in the commercial department of the Public Service Company of Colorado due to reorganization and several mergers has necessitated an increase in the facilities of that department in both personnel and office space. Additional space has been required by the enlarged department under the direction of Charles A. Semrad, commercial manager, and formerly vice-president and general manager of the company in charge of the western division at Boulder, Colo.

New offices have been established on the second floor of the Gas & Electric Building in Denver, and the overflow of other departments has as a consequence necessitated the company taking additional space in the building adjoining it and which was recently vacated by several departments of the Mountain States Telephone & Telegraph Company when it moved into its own new million-dollar home at Fourteenth and Champa Streets.

San Diego Electric Club Holds Christmas Celebration

Christmas was celebrated early by the San Diego Electric Club, San Diego, Calif., and the celebration proved to be a sort of three-in-one affair. The Christmas entertainment was in charge of Charles Stevens, chairman of the better telephone company cooperation committee. Mr. Stevens made the occasion one of celebration for Christmas, for the work of the cooperation committee, and for the fact that the local telephone company had won the first-aid prize of southern California for the telephone company.

At the previous meeting, Walter Wurfel had been named chairman of the nomination committee for the selection of officers for 1925. On the same committee were named Jess Zweiner, Al May, Bruno Barth, and Charles Lawrie. The election of officers and annual banquet date was set for Jan. 13, and is to be an evening affair.

Journal of Electricity Volume Index Ready.—The index for volume 53 comprising the issues of the Journal of Electricity for the months of July to December, inclusive, 1924, will be ready for distribution Jan. 10. Copies may be secured upon application to the circulation department, Journal of Electricity, 883 Mission Street, San Francisco, Calif.

Los Angeles Power Bureau to Spend $9,750,000 in 1925

A construction budget aggregating $9,750,000 has just been announced by officials of the Los Angeles Bureau of Power & Light for 1925. The entire sum will be spent for betterments and extensions to transmission and distribution systems and substations. For the construction and enlargement of substations an amount of $1,350,000 will be spent, and $680,000 will be expended for the construction of 33,000-volt feeders to various sections of the city.

Additions and replacements to the low-voltage distribution system will require $1,945,000. The budget covering substations includes the following:

New Substation, Power & St. John Sts.	$110,000
New Substation, Hunter & Mateo Sts.	300,000
Completion of Hollywood Substation	100,000
Vineyard Substation	210,000
Substation, Thirtieth & San Pedro Sts.	240,000
Athens Substation	115,000
Van Nuys Substation	75,000
Boyle Heights Substation	200,000

$45,000,000 Expenditure Planned For Umatilla Rapids

The combined power and irrigation project at Umatilla Rapids, in the Columbia River Valley, Ore., and its potential and projected development has been reported upon by the engineers of the Interior Department. The estimated cost of the dam and completed power plants is $41,600,000 and the total cost is placed at $45,000,000. The future market possibilities are discussed at length. It is computed that the peak load will reach 760,000 hp. and that this may be developed at $59 per horsepower. Electrochemical and metallurgical industries, railroad electrification, nitrate fixation plants, and industrial heating are all mentioned in the prospectus of future power users as are also public utility companies which, it is asserted, will be able to purchase this power cheaper than they can independently develop it. With a sufficient market developed, the cost of generation is placed at $7.70 per horsepower-year.

The proposed dam for the lower end of the rapids would raise the water level 57½ ft., flood approximately 5,230 acres of land, and necessitate the relocation of 33 miles of main-line railroad track. The outstanding features of this dam are an embankment 2,200 ft. long on the Oregon side with an 1,100-ft. spillway comprising twelve 66-ft. gates across the main channel; a navigation lock 1,000 ft. down stream; a fishway and a gravity section dam.

A high tension transmission line linking Umatilla Rapids with California is declared to be practicable as a future development. It is pointed out that California will have brought most of its potential hydro power into use within the next eleven years, and that outside power may have a ready market there.

A seven-year program is suggested, with expenditures of $1,500,000 the first year, about $5,000,000 the second, and $11,000,000 the third. It is stated that the project could be fifty per cent completed and operating in three and one-half years.

Committee Meeting on National Electrical Code Held

At a meeting on Nov. 21, 1924, of the electrical committee of the National Fire Protection Association, action was taken to enable the committee to function thereafter as a sectional committee under the rules of procedure of the American Engineering Standards Committee. The next meeting of the reorganized committee will be held in New York City, Feb. 17, 18 and 19, 1925, when reports of article committees will be acted upon with a view to the appearance of a 1925 edition of the National Electrical Code about midyear. The committee's report will be presented at the annual meeting of the National Fire Protection Association, to be held in Chicago, Ill., early in May. The association, as sponsor for the code, will then file the revised code with the American Engineering Standards Committee for listing as an approved American standard. It will be published and distributed by the National Board of Fire Underwriters just as have been all previous editions of this foundation of safe wiring practice in the utilization of electricity for light, heat, power and signaling within premises.

A. R. Small, vice-president of Underwriters' Laboratories, presided at the meeting, the attendance including twenty-seven representatives out of a present total of thirty-six. In addition to the National Fire Protection Association, fourteen organizations, national in character or representative of government and general interest, were listed in the roll call.

In view of the increased membership, a revision of the sections working committee personnel was agreed to; assignment of topics is to be according to the article or chapter arrangement of the code, and hence these subcommittees will be known as article committees. The plan of having technical subcommittees is to be continued. In these, individuals not of the section committee serve with all of the privileges of members of the section committee.

On questions which appear to warrant the time and expense required for so doing, public hearings will be held by the article committees. In addition, the public may appear at the annual meeting of the National Fire Protection Association when the sectional committee's report is presented. This report will be published thirty days prior to the meeting in accordance with the association's rules governing committees' procedure. This program makes unnecessary the sort of public hearings or "town meetings" which have heretofore been held in connection with revisions of the code.

N. E. L. A. Endorses Work of Better Business Bureau

The National Electric Light Association representing practically the entire electric light and power and electrical manufacturing industries of the United States has gone on record as endorsing the work of the National Vigilance Committee and the Better Business Bureau.

This action was initiated in the form of a resolution passed at the October meeting of the customer-ownership committee of the N. E. L. A., one of three major committees of the Association, at the request of its chairman, A. Emory Wishon of the San Joaquin Light and Power Corporation, who has been active in Better Business Bureau work in Fresno, Calif.

The action ofthe customer-ownership committee received the hearty endorsement of the remaining governing committees, the public relations committee and the executive committee, at their meeting held in New York, Dec. 9.

The resolution as introduced by Mr. Wishon and adopted by the customer-ownership committee follows:

"The customer-ownership committee of the National Electric Light Association is familiar with the work of the National Vigilance Committee and the Better Business Bureau organized under its auspices, and realizes that this work is exceedingly valuable toward the protection of the public against fraudulent, semi-fraudulent and hazardous propositions offered for investment. The member companies of the National Electric Light Association to a large extent encourage the investment by their customers in their securities, and in carrying out the policy of customer-ownership deem it an obligation to exact their best efforts toward preventing unsound investments by their customers and other investors. This obligation to protect the public exists with reference to public utility securities as well as all other classes of investments or allied investments.

"The committee therefore recommends to the public relations committee of the National Electric Light Association that our Association formally endorse the National Vigilance Committee and the Better Business Bureau movements; the member companies support these organizations, both locally and nationally, and cooperate with them in their activities in whatsoever manner seems most appropriate. It is recommended also that the association advise all member companies of this recommendation and urge their participation if they are not already doing so."

Public utilities generally are obtaining money for their developments through the sale of stock to customers. Of $750,000,000 invested in these securities in 1923, $250,000,000 was invested by customers as the direct result of customer ownership campaigns. These public utility securities are recognized by all financial authorities as being among the best possible investments. They invariably have the endorsement of all bankers and are approved by the Better Business Bureau.

Even with the opportunity for such investments open at all times, the public still listens to the promoter of fraudulent stocks and get-rich-quick schemes, and is mulcted out of tremendous sums each year. A recent estimate is that in the city of San Francisco alone more than $15,000,000 was taken from the public for worthless investments last year.

It is not only for the promotion of investments in utility stocks, but for the protection of the public from fraud that the N. E. L. A. customer-ownership committee is working hand in hand with the Better Business Bureau.

Use of Electricity in Thawing Frozen Water Pipes Subject of Bulletin.—The Engineering Extension Service of Purdue University, Lafayette, Ind., has issued Bulletin No. 7, "Thawing Frozen Water Pipes With Electric Current," by D. D. Ewing and C. F. Bowman. The pamphlet presents a summary of present practices in the art of thawing frozen water pipes with electric currents. Lists of the equipment required for some of the successful arrangements are given, and data on the electrical characteristics of certain small sizes of commercial steel pipe are also presented.

Water Appropriations Asked in Oregon.—Among the applications for permit to appropriate water from Oregon streams recently received in the office of Rhea Luper, state engineer, Salem, Ore., were the following two for power development: J. N. Hart, Portland, for water from the Deschutes River, for the development of 34,000 t.hp. in Wasco County, at an estimated cost of $4,000,000, and James R. Wheeler, Winchester, for water from Mills Creek, for the development of 1,500 t.hp. in Douglas County, at an estimated cost of $60,000, and R. C. Reese, Prairie City, for water from Strawberry Creek and Onion Creek, for the development of 1,278.5 t.hp., in Grant County, at an estimated cost of $80,000.

Book Reviews

PRINCIPLES OF MERCHANDISING

By MELVIN T. COPELAND, Ph.D. Professor of Marketing, Director of Bureau of Business Research, Graduate School of Business Administration, Harvard University. 384 pages. $4. A. W. Shaw & Company, Chicago, Ill.

An unusual and highly valuable work on sales and sales management. This book should be read by and should be the property of every sales manager and executive who is concerned with production and distribution. Perhaps the chief value of the work lies in the fact that it is in part a compilation, with facts and figures given, of the experiences of some of the largest merchandisers in the country. Methods of reducing costs are given; sales plans are outlined; valuable sales data, charts and other needful information are carefully compiled, and the whole is presented in extremely readable fashion. The book could well be placed in the hands of every salesman, and such a procedure would prove a profitable investment for any concern. It should form a valuable reference work for schools and libraries and doubtless will become a text for business administration courses.

Not only does this book analyze buying motives, commodities, sales training and compensation, but it goes further and analyzes the reasons for all of these items. It reveals the relation of merchandising effort to demand and gives concrete examples of the application of sales effort, not only to new markets, but to fields already served. The book contains an unusual combination of the theory of merchandising and of actual practice and should prove of value even to those of great experience.

Meetings

Utah Utilities' Aid Association Holds Annual Meeting

The Traction and Power Mutual Aid Association, composed of employees of the Utah Power & Light Company, the Phoenix Utility Company, which is the construction division of the power company, and the Utah Light & Traction Company, one of the subsidiaries of the Utah Power company, held its annual meeting at Salt Lake City, Utah, Dec. 16. Officers elected for the ensuing year were:

William M. Scott, president; Henry Mann, vice-president; J. R. Matthews, secretary; A. M. Rust, treasurer; Joseph M. Lindsay, Frank Pickering, George A. Gardner, George Eldredge, Lester Seare, directors; G. A. Anderson, auditor, and Dr. C. R. Openshaw, physician.

During the year 1924 the society paid death claims amounting to $2,300, and paid $2,932 sickness, accident and refund accounts to members, carrying $500 reserve and death fund for the year 1925. A surplus amounting to $8,359.33 was divided among the members in the form of Christmas dividends of $9.20 for each twelve months' membership, which was about 60 per cent of what each member had paid in for the year.

The association has a total of 947 members throughout the territory in which these companies operate in Utah, Idaho and Wyoming.

COMING EVENTS

New Mexico Electrical Association—
Annual Convention—Albuquerque, N. M.
Feb. 16-18, 1925

Second Home-Lighting Course for Women Set for January

The first home-lighting course for women held at the Edison Lamp Works of the General Electric Company, Harrison, N. J., last June, met with such success that it has been decided to hold a second conference in January, 1925.

The course will consist of lectures on elementary electricity, fundamentals of lighting, principles of home lighting, including the aspects of health, comfort, color and decoration, and lectures on publicity methods and results. Part of the course will deal with problems in house wiring, home lighting and the use of blue prints. There will be field trips to the show-rooms of wholesale fixture houses and at least one fixture factory.

A.A.E. Installs New Chapter at Santa Barbara, Calif.

Following a dinner held in the Arlington Hotel, Santa Barbara, Calif., recently, the Santa Barbara Chapter was added to the American Association of Engineers. Fifty men and women representing the Santa Barbara Chapter and fourteen guests representing the Los Angeles Chapter were present for the occasion, which served also as the dedication ceremony for the new hall, which had been rushed to completion especially for this event.

Addresses were made by P. H. Ehlers, vice-president; A. A. Anderson, secretary; D. M. Baker, district director, and H. C. Ferry, past director, of the Los Angeles chapter; Herbert Nunn, Santa Barbara city manager, and Mrs. Herbert Nunn; R. A. Klein, state highway engineer of Oregon, and A. L. Ferry of the Long Beach Chapter.

The charter was presented by D. M. Baker, district director, to E. M. Gleason, Jr., chapter president. The other officers are: U. S. Grant, vice-president; G. D. Morrison, secretary, and Lockwood deForest, Jr., assistant secretary.

Discuss Electrical Distribution at Ogden Club Meeting

P. P. Ashworth, distribution engineer of the Utah Power & Light Company, was the principal speaker at the monthly meeting of the Utah Chapter of the American Institute of Electrical Engineers at the Chamber of Commerce in Salt Lake City on the evening of Dec. 3.

Mr. Ashworth presented a paper the subject of which was "The Distribution of Electrical Energy." He discussed the present practice and problems of distributing electrical energy to the consumer. Alternating current systems are coming into use, he said, because direct current is of too low voltage to carry large amounts of power without excessive expenditure for copper conductors.

The speaker outlined the advantages of the 4,000-volt, 4-wire system as used in Salt Lake, Ogden and Logan, Utah, pointing out the factors of safety in connection with it. He stated that the business district of Salt Lake City is the best lighted in the world.

Portland A.I.E.E. Hears Interesting Discussion.—At the joint meeting of the Portland, Ore., sections of the N.E.L.A. and the A.I.E.E., held in December, R. C. Charlton, signal engineer of the Oregon-Washington Railroad & Navigation Company, told of the new system of inductive-type train control installed by his company on a single-track division between Portland and The Dalles. The system, which was adopted by the Union Pacific System after tests at Omaha, Neb., is one manufactured by the Union Switch & Signal Company, and was installed at an approximate cost of $300,000 on order of the Interstate Commerce Commission requiring that one engine division be equipped by the end of this year. By the operation of the system, the train is automatically brought to a stop in case the engineer fails to act on a red-light signal.

Large Scale Electric Oil Pumping to Be Started in Rocky Mountain Region.—Two 12,500-kw. steam-driven generating units are being installed by the Midwest Refining Company in the Salt Creek, Colo., field to supply electric energy for pumping oil wells in that field. This installation, when motors are applied to the wells, will be the first application of electricity to oil-well pumping in the Rocky Mountain field. Boilers in the steam plant will be fired by natural gas from the wells.

Final Schedule Made for P.C.E.A. Technical Section Meet

In the Dec. 15, 1924, issue of the Journal of Electricity, p. 456, announcement was made of the first 1925 conclave meeting of the Technical Section of the P.C.E.A. to be held at the Hotel Fairmont, San Francisco, Calif., Jan. 7-9. Since publication of that notice some changes have been made in the schedule of bureau meetings, and these changes are noted in the following corrected schedule:

	Wed. Jan. 7	Thurs. Jan. 8	Fri. Jan. 9
Hydraulic Power	10 am		
Underground Systems	10 am		
Meter	10 am	9:30 am	
Accident Prevention	10 am	9:30 am	
Overhead Systems	10 am	9:30 am	9:30 am
Apparatus		9:30 am	
Inductive Interference			9:30 am
Prime Movers			9:30 am
Safety Rules			9:30 am
Executive Committee Meeting			4:00 pm
General Meeting		8:00 pm	

No change has been made in the dates set for the general and for the executive meetings, which are set for Jan. 8 at 8 p.m. and Jan. 9 at 4 p.m., respectively.

COMING PACIFIC COAST ELECTRICAL ASSOCIATION MEETINGS

Hydraulic Power Bureau, Technical Section—
Hotel Fairmont, San Francisco, Calif.
Jan. 7, 1925

Underground Systems Bureau, Technical Section—
Hotel Fairmont, San Francisco, Calif.
Jan. 7, 1925

Meter Bureau, Technical Section—
Hotel Fairmont, San Francisco, Calif.
Jan. 7, 8, 1925

Accident Prevention Bureau, Technical Section—
Hotel Fairmont, San Francisco, Calif.
Jan. 7, 8, 1925

Overhead Systems Bureau, Technical Section—
Hotel Fairmont, San Francisco, Calif.
Jan. 7-9, 1925

Apparatus Bureau, Technical Section—
Hotel Fairmont, San Francisco, Calif.
Jan. 8, 1925

General Meeting, Technical Section—
Hotel Fairmont, San Francisco, Calif.
Jan. 8, 1925

Inductive Co-ordination Bureau, Technical Section—
Hotel Fairmont, San Francisco, Calif.
Jan. 9, 1925

Prime Movers Bureau, Technical Section—
Hotel Fairmont, San Francisco, Calif.
Jan. 9, 1925

Safety Rules Bureau, Technical Section—
Hotel Fairmont, San Francisco, Calif.
Jan. 9, 1925

Executive Committee, Technical Section—
Hotel Fairmont, San Francisco, Calif.
Jan. 9, 1925

Munroe, Utah, to Build Hydroelectric Plant.—Bids will be asked in the near future on a new hydroelectric plant to serve the city of Munroe, Utah. The plant will replace the present station, which is inadequate for the city's needs, and will generate 125 kw. under a head of 280 ft. Four thousand feet of 16-in. wood and steel pipe will be needed for the installation. The city has issued and sold $30,000 in bonds to finance the plant. McGonagle & Ullrich, engineers, of Salt Lake, have designed the plant and will supervise its construction.

Personals

A. E. Holloway, superintendent of the commercial department, San Diego Consolidated Gas & Electric Company, San Diego, Calif., has been elected president of the San Diego Chamber of Commerce. For the past year he has been vice-president and also chairman of the county development committee of the organization. In addition to being prominent in civic affairs, Mr.

A. E. HOLLOWAY.

Holloway is a well-known member of the electrical industry. Since 1910 he has been associated with the San Diego Consolidated Gas & Electric Company, having begun as new business solicitor. Later in that year he was made superintendent of new business. Some time after this he became superintendent of the commercial department and has held that position since then. For 1923-1924 he was chairman of the industrial heating committee of the Commercial Section of the P.C.E.A., and he has been appointed a member of the Public Relations Section for 1924-1925. During the year 1922 he was president of the San Diego Electric Club. Mr. Holloway is a native of Indiana and was graduated in 1909 from Purdue University with the degree of E.E.

J. C. DeConly, formerly engineer of construction for the S. & H. Electric Service Company, Alhambra, Calif., has opened offices in the Frost Building, Los Angeles, where he will practice consulting engineering.

William N. Beatty, of the Utah Power & Light Company, Salt Lake City, Utah, was recently in San Francisco, Calif.

A. H. Babcock, electrical engineer of the Southern Pacific Company, San Francisco, Calif., was invited by the National Research Council to attend a session of the American section of the International Union of Scientific Radio-telegraphy held at Washington, D. C., Dec. 30.

James Henderson, general manager of the Hilo Electric Light Company, Hilo, T. H., has just returned to the Islands after a stay of two months in California. Mr. Henderson, who was accompanied by his family, returned on the steamer Matsonia of the Matson line.

J. A. Cannon, auditor, and **George Riblet** and **J. M. Bourus**, assistant auditors of the San Diego Consolidated Gas & Electric Company, San Diego, Calif., attended the annual convention of accountants of the Byllesby Engineering & Management Corporation, held in Louisville, Ky., recently.

Charles A. Tattersall, assistant to the vice-president of the Niagara Falls Power Company, Niagara Falls, N. Y., has been visiting the Pacific Coast for the past two weeks.

G. H. Jones, Commonwealth Edison Company, Chicago, Ill., at the session of the appliance committee at the Commercial National Section's conclave meeting recently held in San Rafael, Calif., furnished some interesting information relative to the installation of electric cooking equipment in hotels and restaurants.

H. E. Sandoval, manager of electric sales, Pacific Gas and Electric Company, San Francisco, Calif., was one of the speakers at the session of the power committee during the conclave meeting of the Commercial National Section.

Joseph Thompson, president, Pacific Electric Manufacturing Company, San Francisco, Calif., was the speaker of the evening at the banquet held at the close of the Commercial National Section's conclave meeting.

E. T. McSpadden, of the Public Service Company of Colorado, Denver, Colo., won the fist prize awarded recently by the George Richards Company, New York City, for the best window display of Hemco plugs.

Dr. W. F. Durand, head of the department of mechanical engineering of Leland Stanford University, Palo Alto, Calif., has been elected president of the American Society of Mechanical Engineers.

C. O. Woodworth, formerly foreman of the Sturgeon Electric Company, Denver, Colo., has resigned from that firm to become a member of the Spinney-Woodworth Heating & Electric Company at 1161 California Street, that city.

A. H. Tracy, electrical engineer for the Byllesby Engineering & Management Corporation, was a visitor recently to San Diego Consolidated Gas & Electric Company. He came to discuss plans and additions for next year on the San Diego company's system.

Frank Silliman, Jr., vice president, Electric Bond & Share Company, New York City, recently spent two weeks in the Northwest looking over the properties of the Pacific Power & Light Company, Portland, Ore., in company with **Lewis A. McArthur**, vice-president and general manager of that company.

L. A. Savage, formerly connected with the construction activities of the Byllesby Engineering & Management Corporation on its Western States Gas & Electric Company projects on the American River, has been appointed supervisor of transportation for the San Diego Consolidated Gas & Electric Company, San Diego, Calif., working in the department of shops and stores under **C. D. Weiss**, superintendent.

S. M. Kennedy, vice-president in charge of business development and public relations, Southern California Edison Company, Los Angeles, Calif., recently paid a visit to San Francisco.

Frederick Haase, in charge of sales of the Frank E. Wolcott Manufacturing Company, Hartford, Conn., is in San Francisco, Calif., investigating local conditions.

C. L. Culbert of the Amador Electric Light & Power Company, Jackson, Calif., was a recent visitor in San Francisco, Calif.

C. C. Shaw, Lalley Electric Company, Portland, Ore., was a recent visitor in San Francisco, Calif.

George W. Rankin of the California Electrical Cooperative Campaign recently spent some time in the Sacramento Valley.

J. J. Welch, vice-president Western Union Telegraph Company, New York City, was a recent visitor in San Francisco, Calif.

Samuel Kahn, vice-president and general manager, Western States Gas & Electric Company, Stockton, Calif., paid a visit to San Francisco, Calif., recently.

John F. Greenawalt, publicity manager of the Mountain States Telephone & Telegraph Company, Denver, Colo., has been elected chairman of the eleventh district of the Associated Advertising Clubs of the World. The district comprises Colorado, New Mexico, Idaho and Utah. He will preside at the annual district convention to be held at Pueblo, Colo., some time in January. Mr. Greenawalt began his career in the utility field with the Colorado Telephone Company, which later became part of the Mountain States Telephone & Telegraph Company. In 1911 he was made advertising manager of the latter company and later general publicity manager. He is secretary of the Colorado Public Service Association and is a member of the Rocky Mountain Committee on Public Utility Information

JOHN F. GREENAWALT.

of the National Electric Light Association and practically all of the electrical and utility associations of Denver as well as numerous other civic and commercial organizations. He has just recently elected district governor of the Kiwanis Club. Before engaging in his present work Mr. Greenawalt taught school and later was active in newspaper work.

R. W. Clark, assistant sales manager, Puget Sound Power & Light Company, Seattle, Wash., was among those who attended the conclave meeting of the N.E.L.A. Commercial National Section recently held in San Rafael, Calif.

C. L. Edgar, president and general manager, Edison Electric Illuminating Company, Boston, Mass., was recently in San Francisco. While in the West he was present at the recent conclave meeting of the Commercial National Section of the N.E.L.A. held at San Rafael, Calif.

J. J. Cooper, general manager, Mountain Electric Company, Denver, Colo., has been appointed representative of the Mountain region on the National Council or Federation of Electrical Leagues, the group authorized at the Association Island meeting last September.

P. W. Sothman, formerly chief engineer of the Hydro-Electric Power Commission of Ontario, Toronto, has associated himself with the engineering firm of M. H. Avram & Company, New York, N. Y.

E. A. Palmer, for the past two years manager of the transportation division of the San Francisco office of the Westinghouse Electric & Manufacturing Company, has been made manager of the light traction division of that company with headquarters at East Pittsburgh, Pa. A graduate of Cornell University, Mr. Palmer began his career in the field of transportation by entering the employ of the Public Service Railway Corporation, Newark, N. J., where he became division master mechanic. In 1916 he joined the force of the American Brake Shoe & Foundry Company, New York, N. Y., as mechanical expert, his duties involving checking up on the usage obtained from the company's products. A year later he became salesman of transportation products for the Westinghouse Electric & Manufacturing Company at San Francisco, Calif. In 1922, when the

E. A. PALMER.

transportation division of the Westinghouse company became a distinct organization, he was made manager of the San Francisco division. Mr. Palmer is a member of the American Institute of Electrical Engineers, the American Electric Railway Association and the National Transportation Institute, and also belongs to the Transportation Club and the Pacific Railway Club.

R. G. Gentry, D. D. Sturgeon and **F. L. Easton**, members of the advisory board of the Electrical Cooperative League, Denver, Colo., have been designated as a welfare committee by W. A. Guscott, acting chairman, their function being to keep in touch with all cases of sickness or distress of league members.

J. Charles Jordan, manager publicity department, Pacific Gas and Electric Company, San Francisco, Calif., has been appointed a member of the exhibits committee of the Public Utilities Advertising Association to represent seven Western states. The association is affiliated with the Associated Advertising Clubs of the World and is preparing a traveling exhibit of public utilities advertising which will be displayed at the Advertising Clubs convention to be held at Houston, Texas, next May.

R. A. Balzari of the Westinghouse Electric & Manufacturing Company, San Francisco, Calif., recently spent several days in the Sacramento Valley on business.

Fred Todt, San Francisco, Calif., district manager, Pacific States Electric Company, recently attended a meeting of the Sacramento Valley Electrical Society while on a visit to Sacramento, Calif.

Victor W. Hartley, executive secretary of the California Electrical Cooperative Campaign, recently spent some time in Sacramento, Calif., in connection with the Better Home-Lighting Contest.

Walter F. Price, executive secretary of California Electragists, stopped off for several hours in Sacramento, Calif., while going through the Sacramento Valley recently.

Ellery W. Stone, president, Federal Telegraph Company, San Francisco, Calif., recently visited Sacramento, Calif., where he addressed a meeting of the Sacramento Valley Electrical Society.

W. C. Stevens, manager of production and development, Cutler-Hammer Manufacturing Company, Milwaukee, Wis., recently visited San Francisco, Calif.

Dean D. Clark, commercial manager, Mountain States Telephone & Telegraph Company, and treasurer of the Electrical Cooperative League; **P. Harry Byrne**, manager of the electrical department, Larsen Plumbing, Heating & Electrical Company, and **C. E. Addie** of the Public Service Company, all of Denver, Colo., took prominent parts in the recent Community Chest drive in that city.

J. H. Perlewitz, manager, Western Electric Company, Salt Lake City, Utah, and a member of the board of the Rocky Mountain Electrical Cooperative League, was a speaker at a recent luncheon meeting of the Electrical Cooperative League, Denver, Colo.

E. A. Watkins has secured sole ownership of the Electric Supply Company, Oakland, Calif., and will continue the business under the same firm name.

Cass Schneider of the Electrical Supply Company, Sacramento, Calif., was a recent visitor to San Francisco on business.

F. W. Roller, president of the Roller-Smith Company, New York City, recently stopped for several days in San Francisco, Calif., while en route to the Orient.

Walter S. Wurfel, manager of the Electric Supplies Distributing Company of San Diego, Calif., recently spent some time in the Imperial Valley.

R. B. Gordon, until recently New York stores manager for the Western Electric Company, has been made manager of the New York telephone distributing house of that company, succeeding J. B. Odell.

Howard W. Fishburn, manager of the electrical department of the B. K. Sweeney Electrical Company, Denver, Colo., and a former member of the advisory board of the Electrical Cooperative League of that city, has been reappointed a member of the board as a representative of the manufacturers'

HOWARD W. FISHBURN.

division. Mr. Fishburn is a native of Denver and has had all of his electrical experience as a member of the Sweeney firm. Starting with that company in 1916 as a general salesman, he later became an electrical specialist and for five years has devoted all of his time to the electrical department. Prior to his appointment as manager in 1922, he served as assistant manager of the department.

Obituary

Audrey Wayland, of the Allied Industries, Inc., San Francisco, Calif., died Dec. 6 as the result of injuries received in a collision of trains on the Key System, near the Oakland, Calif., mole.

Frank Dabney, manager of the Puget Sound Power & Light Securities Company of the Stone & Webster organization, died in Seattle, Wash., Dec. 12, 1924, following a short illness contracted immediately upon his return from an extended Eastern business trip. Mr. Dabney was born in 1853 at Fayal, Azores Islands, where his father, John Pomeroy Dabney, served many years as American vice-consul. After being educated at Fayal and Boston, Mass., he entered the foreign shipping business. Later he was identified with coal mining, timber and railroad interests in Ohio and elsewhere until 1900, when he became associated with the Stone & Webster interests in Seattle.

TRADE NOTES

The Pierce-Tomlinson Electric Company, Portland, Ore., has recently moved from its old location at 286 Oak Street to 92 Fifth Street, where it has secured a better location for retail trade. T. F. Pierce, having taken over the interest of his former partner, is now the sole owner and manager.

The B. & R. Electric Supply Company of Denver, Colo., has been appointed distributor of Westinghouse lamps in the Mountain region in addition to the Mine & Smelter Supply Company, Westinghouse agent-jobbers.

The Olympic Electric Company, Aberdeen, Wash., has opened a new electric store in the Wolff Building in Olympia. This is the third of the company's chain of stores, the other two being in Port Angeles and Centralia. The company will carry a full line of electric appliances.

The Oster Manufacturing Company, Cleveland, Ohio, has recently placed on the market a new electric pipe threader which is claimed to reduce greatly the time and cost of pipe threading. The machine, which is portable, is driven by a 1/3-hp. Westinghouse motor furnished with a 10-ft. cord and a screw plug which may be screwed into an ordinary light socket. It may be used on ¼-in. to 2-in. piping.

S. K. Lehman Company, electric jobbing firm, formerly in Room 610 Wesley Roberts Building, Los Angeles, Calif., has moved into larger quarters in Rooms 309 and 310 of the same building, the name of which has been changed to the Cotton Exchange Building.

The Aetna Electric Company, 341 South Western Ave., Los Angeles, Calif., has been purchased by H. E. McArthur, owner of Crown Electric Company, 5161 South Vermont Ave., dealer in electric fixtures, and will be operated as a branch store.

The F. W. Wakefield Brass Company, Vermilion, Ohio, has recently perfected an attachment for mounting an individual pull chain switch within the fixture canopy upon the main support of the fixture, as required by code. This mounting consists of a piece of sheet metal of sufficient gauge, stamped to form. It is perforated with two holes of proper size so that it slips over the iron pipe fixture support and is held firmly between the pipe casing and the hickey. The shape of the stamping permits the switch to be mounted in any of four different positions so that it meets practically any condition. The company is now supplying this new switch mounting as an accessory with all its "Red Spot" chain pendent type hangers.

The Hisey-Wolf Machine Company, Cincinnati, Ohio, will mail upon request its Bulletin No. 605, which describes the company's new friction head electric screwdriver.

The Sangamo Electric Company, Springfield, Ill., has recently placed upon the market Types F and G current transformers designed for accurate metering where the secondary burden is high.

The Standard Electric Stove Company, Toledo, Ohio, recently held a convention of its salesmen at the factory. Representatives from all sections of the country were in attendance.

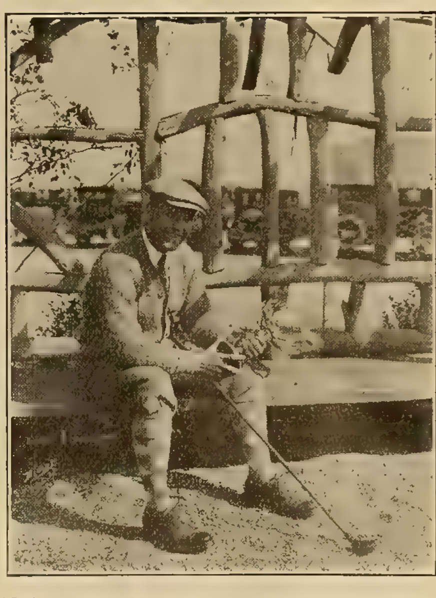
The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has published "Cutler-Hammer Electric Elevator Controllers," a 48-page booklet known as publication No. 3082. This booklet illustrates and describes many types of elevator control apparatus for passenger and freight elevators. A section is devoted to auxiliary apparatus for use with elevator controllers, including reversing switches, floor selectors, various limit switches, car switches and door switches, and another to motor, fuse and wire ratings with numerous tables.

The Peerless Light Company, Chicago, Ill., has issued its first radio catalog, No. 101. List prices are quoted, and a confidential discount sheet is enclosed for dealers' use.

Heine Boiler Company, Inc., St. Louis, Mo., has reprinted in pamphlet form, "Tests of a Steam Generating Unit at a Municipal Power Plant," a report published in Power, Sept. 16, 1924, on a series of tests applied to a Heine V-type bent-tube boiler installation.

Hydro-Electric Manufacturing Company, Milwaukee, Wis., has issued for consumer distribution a folder setting forth the advantages of its Hydrolectric dishwasher.

The Kehoe Company, Toledo, Ohio, has published for distribution to consumers a folder descriptive of its electric dishwasher, the Kehoe.



K. E. Van Kuran, district manager of the Westinghouse Electric & Manufacturing Company, Los Angeles, Calif., is here shown with his winning smile and the trophy which he won at the recent convention of the American Institute of Electrical Engineers at Pasadena. Mr. Van Kuran won the Fisken cup, which is awarded annually to the player having the lowest gross score and which he will keep in his possession for the ensuing year.

The Square D Company, Detroit, Mich., has recently designed and incorporated in its Square D safety switch a new type of cross bar construction. A steel cross bar is heavily insulated with tubes of molded composition possessing superior mechanical and greater dielectric strength and with a low per cent absorption of moisture which prevents warping and the consequent distortion of blade alignment. Wide fibre washers prevent accumulation or adherence of dust, breaking up any continuous path of dust to ground, and also act as baffles, protecting the cross bar links, spring housing or the ends of the steel cross bar from abnormal arcs. The insulating tubes have an offset at the ends so that dust cannot work in under the washers, and a new type of blade hook distributes pressure equally and eliminates extra wear on the molded composition tubes.

Stephens-Adamson Manufacturing Company, Aurora, Ill., has compiled S-A Chains and Gears Catalog No. 27, which contains the latest and most exhaustive list of its chains, sprockets and gears. Requests for copies should be sent on business stationery so that the company may have information concerning the placement of these catalogs with a view to rendering further service to the users of Catalog No. 27.

The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has perfected a sight tube for use in determining the condition existing inside the tanks of large oil circuit breakers without the necessity of emptying the oil. The device is built on the principle of a periscope and is so constructed that contacts of the breaker may be easily inspected by the operator.

The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has issued Publication C-2, descriptive of its inductive time-limit controller for steel mill service. This controller meets the demand for time-limit control and at the same time eliminates features such as dashpot and other mechanical means for securing the uniform period of acceleration.

The Reynolds Electric Company, Chicago, Ill., has recently sent out Bulletin No. 401 describing its timer or control for "stop and go" traffic signals. The drum contacts and brushes are of the same general construction as Reco flashers. Bulletin No. 501, also recently issued, tells how these latter devices may be used to double the effectiveness of window displays.

The Electric Supply Company, Oakland, Calif., on Jan. 1 moved into new and larger quarters at 301 Ninth Street, that city.

The Triumph Electric Company, Cincinnati, Ohio, has recently prepared for distribution a new bulletin on its TR self-start motors.

The Bryant Electric Company, Bridgeport, Conn., has issued its latest and most complete catalog in three styles: "A," a loose-leaf style, 8½x10 in., for use of jobbers and large dealers; "C," a large bound style, 7½x10⅝ in., and a miniature style, 4⅝x6¼ in., for pocket use.

The American Rolling Mill Company, Middletown, Ohio, has published "Iron and Steel for Electrical Uses," covering the history, manufacture and magnetic properties of Armco electrical sheet steels and Armco-ingot iron.

A McGraw-Hill Publication
San Francisco, Calif.

January 15, 1925
25 Cents

Journal of Electricity

Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES

Journal of Electricity entered as second class matter February 17, 1921, at the post office at San Francisco, under the Act of Congress, March 3, 1879. Published the 1st and 15th of each month, at 883 Mission Street, San Francisco, California.

Journal of Electricity

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C. T. HUTCHINSON, Editorial Director
G. C. TENNEY, Managing Editor
G. W. BARKER, Associate Editor
J. W. OTTERSON, Associate Editor
G. R. HENNINGER, Associate Editor
B. H. SNOW, Northwest Editor

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Contents

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Chicago, Old Colony Building
Philadelphia, Real Estate Trust Building
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Transmission-Line Map for 1925

IT is the custom of the Journal of Electricity to issue a transmission-line map of the eleven Western states every two years. This work started back in 1905 when a small map of the transmission lines of California was printed. Five years later the first supplement map of the lines of the Western states was issued. In 1915 this map was corrected and reissued. This was done again in 1920. Since that time the development and extension of the electric service companies have been so rapid that it has been found necessary to issue the map every two years.

The 1925 map will be a supplement to the Feb. 1 issue. Instead of conforming to the old standard size, 20 x 24 in., this year it will be 32 x 40 in. This larger size is necessitated by the congestion in California and other Pacific Coast states where development has been most rapid.

The new map will show among other things all transmission lines in California, Oregon, Washington, Idaho, Montana, Wyoming, Colorado, Utah, Nevada, Arizona and New Mexico. In the case of some of the smaller utilities lines of lower voltage are shown. It likewise shows all hydroelectric and steam generating stations with their capacities. Some of the major undeveloped power sites are also noted.

For use of engineering or other departments of utilities which desire full size prints of the map, the Journal of Electricity is in a position to supply blue prints from the original tracings at the nominal price of $5. This map is 44 x 54 in. Copies may be secured by addressing the San Francisco office, 883 Mission Street.

EDITORIAL

If Municipal Employees Are Taxed, Then Tax Municipal Corporations

UNCLE SAM has the reputation of being a niggardly paymaster, as everybody knows who has ever had occasion to compare salaries paid in government service with those for corresponding occupations in civil life. The same is true of state and municipal positions, the principle being apparently that to hire more men at lower pay is cheaper than fewer men at higher pay.

Nevertheless, there are many men in the government service who are honest, hard-working and competent, to whom society owes a debt that it can never repay, men who have so conscientious a regard for their work and responsibilities as to be utterly forgetful of self in their devotion to the task before them. This aggravates the injustice of the ruling recently announced by the Commissioner of Internal Revenue to the effect that the pay of employees of the various government-owned and operated power enterprises is subject to income tax because they are engaged in a business competing with private business, and are therefore "quasi-private" in their character.

The exemption of incomes earned in the government service has always been considered as sort of palliative to their admittedly low scale; in fact, it is a definite consideration to those entering the service of the government. Therefore, such a ruling appears as no less than a breach of faith on the part of the government. What aggravates the injustice even further is the additional proviso that the ruling is retroactive, and the unfortunate employees of municipal power projects are in a fair way to bankruptcy at the hands of the very government they have served so conscientiously.

It is hardly necessary to state that we hold no brief for government-owned and operated utilities. On the contrary, we consider such enterprises a menace to the welfare of the American people. Nevertheless, for the unfortunate individuals employed by municipal power projects we have the most sincere sympathy at the predicament in which they find themselves. Undoubtedly there will be found in our halls of Congress men whose sense of justice will compel them to espouse the cause of municipal power project employees and either have the ruling rescinded or readjust the pay scale to equalize the deduction.

A moral lesson is pointed out by this situation. Here we have the spectacle of tax-free securities representing a tax-free enterprise manned by tax-exempt employees in competition with tax-paying private capital, thus placing an unjust burden upon taxpayers outside of this favored circle and creating a fictitious profit that is really a deficit to be made up by taxes on private enterprise.

If it is just and proper to tax the pay of employees of municipal power enterprises, why should not it be equally so to tax the municipal enterprises themselves? Certainly they are competing with private enterprises and are therefore "quasi-private" themselves. We would be interested in hearing from the Commissioner of Internal Revenue on this point, as would also the purchaser of the tax-free bonds who would be in the same position, relatively, as the municipal power company employees. What is sauce for the goose is sauce for the gander.

Earning the Tribute of the Community "We"

A POWER man was listening in on a conversation in the Pullman car. "We don't do that in Walla Walla," he overheard, in reference to some power company practice under criticism by a man from another community; "our policy is somewhat different." And the speaker went on to defend the company most eloquently.

Now, the power man was an official of the utility which served Walla Walla—and yet he did not recognize its champion. After the party broke up, he went to his fellow passenger and introduced himself, apologizing for not knowing an employee of his own company. "Oh," said the man, "I have no connection with the power company. I am a clergyman. But I have been greatly impressed by the constructive work which the office of your utility in our community has carried on."

His "we" had been a community "we," spoken out of pride of ownership. Here is a real tribute to the policy of taking the public into partnership. It is the true solution to the unending problem of how to combat the propaganda of public ownership.

Price-Competition as a Stimulus to Sales Campaigns

THAT high-grade electrical merchandise, properly advertised and properly installed, can be sold in the face of price-competition is the experience of the British Columbia Electric Railway Company, Ltd. On another page of this issue is a description of a kitchen lighting campaign staged by that utility. During the course of the special sale, a non-electrical merchandiser in the city brought out a competing

kitchen unit at a much lower price. Advertising and sales arguments of the British Columbia company were changed to meet this competition. Not only did its salesmen sell just as many units per day as they had previously, but the volume actually increased until the closing week they were selling 400 units per day. The natural tendency would have been to cut prices to meet the competition. However, competition merely served to increase the efforts of the salesmen and to make the campaign even more successful than had been anticipated. The experience of this utility should serve as an example to other public service companies or to electrical dealers faced with a similar situation.

The Debasement of the Title "Engineer"

"ENGINEER:—I. vt. To execute or manage by contrivance; to plan and superintend the construction of. II. n. One versed in or practicing any branch of engineering; one who manages an engine; an engine-driver; a manager; an inventor; a plotter,"—states a standard dictionary.

Even if we consider only the second half of the definition, that dealing with the word as a noun, it is evident that confusion as to actual meaning is admitted by the accepted authority of the English language. Until recently the term "engineer" really meant something, because it referred to a person who possessed specialized technical training. Such a title could not be assumed except on the basis of from four to six years of specialized training at a recognized institution of learning or, perhaps, through several times that length of time spent in practical field work. The latter would apply, for instance, to the locomotive engineer, the stationary engineer, the marine engineer, and such persons as had gained a creditable amount of technical knowledge through practical experience and hard knocks.

Times have changed, however, and not particularly for the better. We see mingled with the professional application of the word such incongruities as "service engineer," "cleaning engineer," "binding engineer," and from the trend of things we may next expect to find the term applied to the municipal dog-catcher and the village constable. A certain New York daily mentions in all seriousness a "social engineer." The result is a term that means less than the average cross-word puzzle or double-ciphered infinitesimal which our professors so fondly dwelt upon.

Another serious aspect of the situation is the so-called school of engineering that advertises its ability to transform any student into a civil, electrical, mechanical, or what-not "engineer" in one or two or, at the most, three years and without previous technical training of any sort whatsoever. These institutions bleed alike the true engineering profession and the uninformed prospective student who is attracted by glowing promises of "big pay."

It would seem that both evils could be curbed quite effectively through legislation licensing the use of the word "engineer," and providing suitable safeguards and standards which would elevate the profession in the public mind and faith to a plane equal to that occupied by the other recognized professions. "Diploma mills" are quite as dangerous to the fundamental structure of things when regarded from an engineering standpoint as they are when viewed from a medical angle. Recognized institutions of higher learning realize the dangers of the present trend, but the first move toward correction must come from the engineering field itself.

As a possible solution to the difficulty, the suggestion has been made that the term "engineer" as now applied to this technical profession be abandoned in favor of a new one of more exclusive meaning. "Technologist" is suggested and is perhaps the most descriptive yet offered. For instance, the person fulfilling the necessary requirements in electrical theory and practice would be permitted to use the title "electrical technologist." It would appear, however, that something more than a new word is necessary if the desired end is to be accomplished.

Success of N.E.L.A. Convention Depends Upon United Western Effort

ANNOUNCEMENT on another page of this issue marks the first step in organizing for the convention of the National Electric Light Association to be held June 15-19 next. An inspection of the committee personnel and particularly the number of committees required gives some idea of the magnitude of the task assumed by the industry on the Pacific Coast.

It is expected that the registration will exceed 3,000, of which not less than one-third will come from states other than California. The San Francisco auditorium, with its main assembly hall seating more than 10,000 and the many smaller halls for the section meetings, assures ample accommodations for the business sessions, while San Francisco hotels will be able to furnish a type and variety of entertainment to suit all tastes without the least overcrowding.

Even so, requests are already coming in for hotel accommodations. These will increase in number as the time grows nearer. In the meantime committee chairmen are busy casting about to fill up the ranks of the workers for their respective tasks. It is believed that the entertainment committee will have everything but sleep during the eventful week. With San Francisco's attractions so numerous and varied, visitors from the Middle West and East have a real treat in store for them, and, in truth, the best we have will be none too good.

In order that the convention may be an unqualified success, all branches of the industry in the West must cooperate in a wholehearted manner. Gatherings like conventions do not run themselves. That they may function smoothly, that confusion and loss of time may be avoided, many men must give of their time and energy, numerous tasks must be done, countless details must be given attention. Members of the committees will be busy men.

Those who are not yet members of the Pacific Coast Electrical Association should hasten to send in their applications. Truly, the forthcoming convention is an obligation not only of the committeemen but of every individual within the industry. It will be a great thing for the West, this convention, and the entire industry must unite in showing our guests that Western hospitality is something more than a mere figure of speech.

Another Triumph for the West

THE winners in the National Home Lighting Contest have been announced. The first prize goes to Miss Julia Groo of Portland, Ore. This Western girl will build her $15,000 electric home in that city. The second national prize, a $1,200 scholarship in any college or university, goes to Guadencia Pinaroc, a Filipino high school boy of Oakland, Calif.

The electrical industry of the West has cause to rejoice. The work of conducting the Better Home Lighting Contest called forth the united efforts of all elements of the industry, and the million or more entries in over 5,000 communities in the United States and Canada indicate how well this work was done. Certain benefits, many of which are already apparent, are bound to accrue to the various branches of the industry. Besides this, on account of the recent announcement of the prize award commanding front-page space throughout the entire country, all eyes have been focused for a brief time on the National Electric Light Association, placing that organization and all connected with it in a most favorable light.

Of course most of the direct benefits of this publicity will go to Portland. The model home will be a show place in that city for some time, and the electrical men of Portland will have a rare opportunity to point to it as an example of what electricity can do for the comfort and happiness of all who are wise enough to make use of its many services. True, it is Portland's triumph—but the entire West will bask in the reflected glow of that triumph.

Work of the California Electrical Cooperative Campaign

CALIFORNIA is credited with many accomplishments in behalf of the electrical industry; in fact, our Eastern brothers are inclined to criticize us for boosting indiscriminately. Nevertheless, the fact remains that they look to us for leadership in many important particulars.

This is the season of the year when the affairs of the California Cooperative Campaign come up for consideration—financial consideration, that is—and a word or two on the subject of the campaign is appropriate at this time. To give anything like a story of the work of the campaign would involve writing a history of the commercial phases of the industry itself, for the campaign has been the focal point about which the best minds of the industry gathered and worked out its problems.

The convenience outlet is a term that has made history, and will maintain that place in spite of some ill-advised attempts to change it. The electrical home, a distinctly California product, had its inception in the Cooperative Campaign. Then the countless other applications of the "Do it electrically" idea, cooking, heating and refrigeration, are ripe for further development.

In California there will be added to the installed capacity of central stations more than 250,000 hp. in hydroelectric energy in 1925, to say nothing of the existing field that has been scarcely scratched. Never has there been a greater need for the kind of service to the industry that the campaign can render than now. And the industry will profit many times over for the relatively small support that it is called upon to render.

There is not a cloud on the 1925 electrical horizon, so let us make hay while the sun shines.

DISCUSSION

Calls Attention to Misquotation of Cost of Pit No. 3 Tunnel

To the Editor:

Sir: Several days ago I called your attention to an error in a news item which appeared in the Dec. 15, 1924, issue of the Journal on page 455, entitled "Pit No. 3 Bore Holed Through and Ready for Lining." The last paragraph of this article reads as follows: "The time and cost of the job to date is running well under estimates prepared before the work was started. The cost of the work up to Sept. 25 was $1,038,000, while the estimated total cost of the completed tunnel is $3,500,000."

The figure of $1,038,000 covers only labor cost for work done by this company up to Sept. 25 and does not include such items as powder, timbers, power, etc., nor does it include the indirect cost such as camps, equipment, housing, roads, trails, interest during construction, etc. Again, too, something over 2,000 ft. of this tunnel was done by contract, the cost of which is not included in the figure $1,038,000.

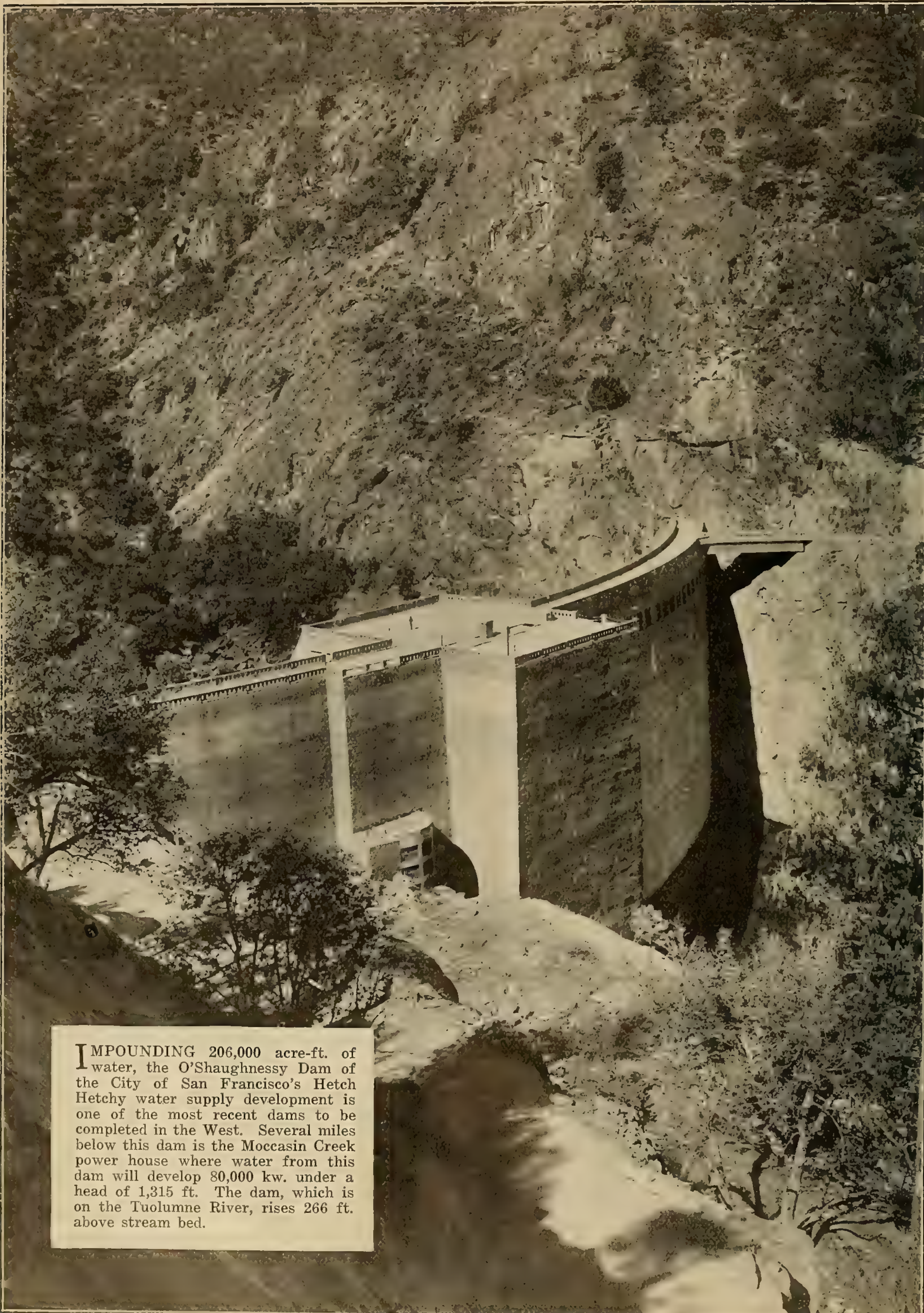
You will readily understand that the indirect costs of a job such as this are substantial items of cost and will materially increase the figure given. The final figures showing the completed cost are not yet available and I am therefore not in a position to say what this cost should be.

It is to be regretted that you were furnished with the wrong figures but unfortunately mistakes of this kind will occur occasionally.

P. M. DOWNING,

Vice-president in charge of Electrical Construction and Operation, Pacific Gas and Electric Company.

San Francisco, Jan. 7, 1925.



IMPOUNDING 206,000 acre-ft. of water, the O'Shaughnessy Dam of the City of San Francisco's Hetch Hetchy water supply development is one of the most recent dams to be completed in the West. Several miles below this dam is the Moccasin Creek power house where water from this dam will develop 80,000 kw. under a head of 1,315 ft. The dam, which is on the Tuolumne River, rises 266 ft. above stream bed.

Customer-Ownership From the Standpoint of the Utility Customer

By E. J. Beckett
Assistant Treasurer, Pacific Gas and Electric Company, San Francisco, Calif.

In this article Mr. Beckett departs from the practice of considering customer-ownership from the utility's point of view and deals with the benefits that accrue to the public. His analysis of the ownership of a representative company shows the growing tendency on the part of the public to purchase small blocks of utility stock.

THE "customer-ownership" plan of stock selling by public utilities has become so well known that it needs no introduction. Although originated only ten and one-half years ago, the movement to promote home ownership of public utilities has reached such proportions that in the past decade over seven million shares of stock of the electric light and power companies of this country have been sold direct by these companies to approximately one million investors, $200,000,000 worth of stock having been so disposed of in 1924. These figures, covering merely a single branch of industry, afford some conception of the magnitude of the movement, which has been embraced also by gas, telephone and telegraph, street railway and other public service corporations throughout the United States and has been responsible for the dissemination of securities among the general public to an extent which would have been practically impossible under the old methods of underwriting security issues.

A recent authority* estimates that the number of stockholders in the United States increased from 7,400,000 in 1910 to 8,600,000 in 1917 and to 14,400,000 at the close of 1923. While this vast increase in the number of investors in recent years cannot fairly be ascribed entirely to the efforts made by the utilities to popularize their securities among the local public, there can be no question but that it is attributable in large measure to the appreciation by corporation managers everywhere of the soundness of the principles underlying the customer-ownership movement. Of particular interest is also the statement made by this writer that whereas in 1917 individuals with incomes of less than $5,000 per annum received but 9.5 per cent of all dividends paid by corporations throughout the country, in 1922 they received 18.4 per cent, thus doubling their proportionate share of the profits of industry in five years. Literally millions of wage earners, who but a few short years ago would have associated stock certificates with affluence and regarded all bondholders as belonging to the gilded rich, now cash their quarterly dividend checks or clip their coupons as a matter of course.

*H. T. Warshon in Quarterly Journal of Economics, November, 1924.

It is appropriate enough that in California, where the customer-ownership movement had its inception, there should be a larger proportion of the population participating in the proprietorship of the public utilities than is probably the case in any other state in the Union. A recent survey shows that there are at the present time approximately 125,000 owners of the preferred and common stocks of the twelve largest gas and electric companies operating in this state, of whom 112,000 actually reside within its boundaries. Assuming each stockholder to represent a family of five persons, these numerous partners of gas and electric companies in California would populate a town almost as large as San Francisco. As previously indicated, however, it is only within the last few years that this widespread distribution of ownership to the public has been accomplished. The initial step was taken by the Pacific Gas and Electric Company in June, 1914, and some of the results of that company's campaign are noted later in this paper.

Much has been said and written about the advantages to the public utilities of this general distribution of their securities among their customers. It is fairly obvious that a plan of this kind, which enables a public service corporation to finance a considerable portion of its construction program through the sale of stock, and at the same time to secure the favorable interest of a large and representative class of people, naturally commends itself to the utility companies. It is not proposed to discuss this phase of the subject here. The advantages accruing to the general public from such a scheme, however, while none the less real, have probably not been so widely discussed or so generally appreciated. As a matter of fact, in the final analysis the general public is the real and ultimate beneficiary under this plan.

Stimulus to General Industry

The dependence of industry and agriculture in California upon an ample supply of electric energy is now fairly well understood. The extent to which the vast strides made in the electrical industry in that state within the last few years have been made possible by the customer-ownership plan is not so generally realized. Largely by this means the power

companies have been enabled to carry forward a tremendous program of extension and development involving the expenditure of hundreds of millions of dollars for wages and material, at the same time furnishing a strong and enduring stimulus to industry of every character through the additional amount of electric energy thus made available. Under this stimulus, aided by natural advantages of climate and unsurpassed facilities for rail and water transportation, California is developing rapidly as a

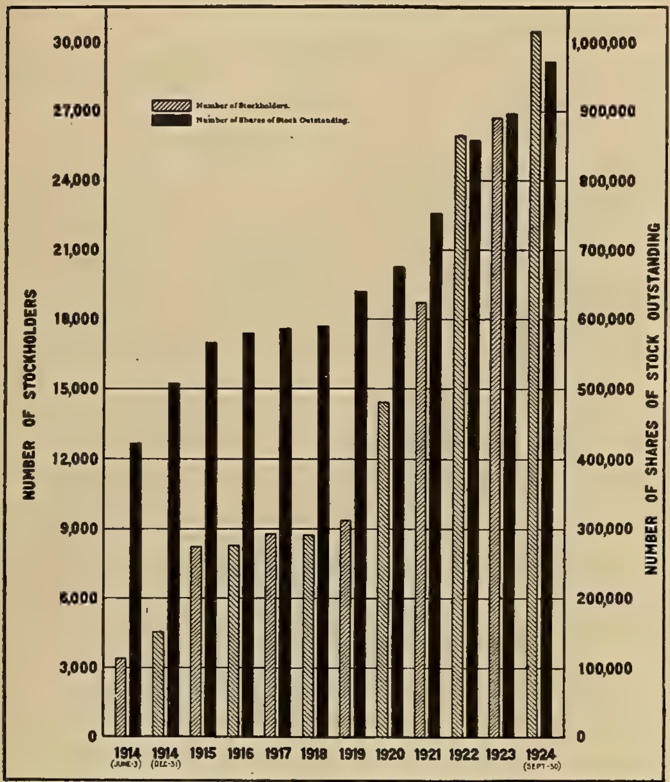


Chart comparing increase in Pacific Gas and Electric Company stockholders with increase in outstanding stock since initiation of customer-ownership plan.

manufacturing as well as an agricultural state. The benefit, direct and indirect, to every resident of that section of the Pacific Coast is at once apparent.

Benefit of Lower Cost of Capital

Customer-ownership, however, has not only been instrumental in furnishing the direct means of raising a large amount of the necessary capital through the sale of stock to a multitude of local investors, but through the increased equity secured by this junior financing it has very materially facilitated the sale of bonds. A better market for new securities means a lower price paid for capital. Since the cost of securing funds for necessary extensions and facilities is a highly important factor in rate-making proceedings, it follows that the consumer taking service under rate schedules based on a lower cost of capital receives the direct advantage of the improved credit position of the utility.

Another factor which tends to lower the cost of capital is the relatively slight expense incurred in the direct sale of securities, which is in the great majority of cases lower than the underwriting fees customarily charged by investment houses. In this connection, the following statement of costs incurred by the Pacific Gas and Electric Company in selling $38,500,000 par value of its first preferred stock indicates that this large volume of financing was accomplished at an average expense of only 88.5 cents per share.

Selling Costs of First Preferred Stock June 3, 1914, to Dec. 31, 1923.

	Total Cost	Cost per Share
Commissions (in recent years paid only to employees)	$126,886.86	$.329
Advertising	124,092.79	.322
Printing, paper and postage	43,811.54	.115
Salaries and expenses of stock sales department	45,903.62	.119
Total cost	$340,694.81	$.885

Better Service

Relations between the general public and those companies supplying it with everyday services which have become so integral a part of daily life have immeasurably improved during recent years, largely because of the new source of personal contact between the company and the public afforded by a large body of customer-stockholders. The public has been and will continue to be the gainer from the better mutual understanding thus established, receiving improved service as a result of greater solicitude on the part of the utility to merit popular favor, coupled with its better financial ability to meet the demands of a growing territory.

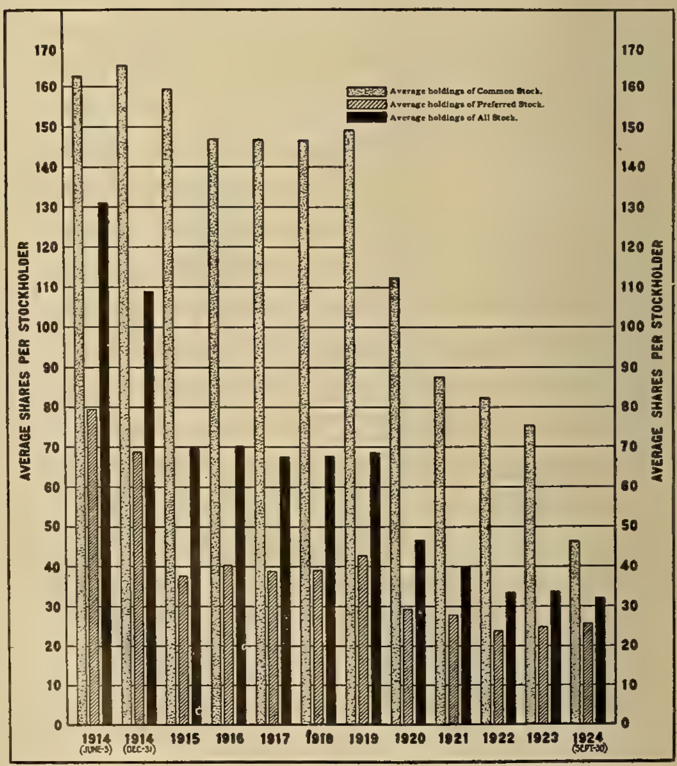


Chart prepared by Pacific Gas and Electric Company showing decreasing average holdings of stock since initiation of customer-ownership plan.

Encouragement of Thrift

Not the least among the advantages which accrue to the public may be cited the stimulus given to the cultivation of thrift. Thrift is a character-

builder, individual and national. All educational work to be successful must be done with the individual, and the public utilities are performing a real public service by fostering the habit of thrift among wage earners. Thrift in the abstract is an excellent thing, but for most people some definite tangible plan of continuous saving is necessary. The utilities, by permitting of the purchase of stock on the installment plan, have probably done as much to stimulate thrift as any other single agency within recent years. They have not only shown how small amounts of money set aside periodically soon accumulate into sizable sums, but they have also shown how the savings of even the most inexperienced investor can safely be made to earn a much larger average return than that paid by the savings banks. They have made direct investment, rather than investment by proxy through the medium of savings banks, easy of accomplishment.

One need only to glance at the following classification of the Pacific Gas and Electric Company's stockholders with respect to the size of their holdings to realize the appeal which a local utility security of the right kind makes to the very large class of individuals whose buying power is somewhat limited. Of the 30,270 individuals who owned stock in this company at the close of October, 1924, more than one-half—16,255 to be exact—owned ten shares or less. Of these 1,971 owned one share only, 1,791 owned two shares each, 1,048 three shares, 797 four shares, and 3,599 lots of five shares each. It is entirely safe to say that literally thousands of these small stockholders are making their very first investment, and through this means are at least making a start on the road to financial independence.

Classification of Stockholders of Pacific Gas and Electric Company, Oct. 31, 1924.

	Total Stockholders	Per cent of total	Accumulative totals: No. of Holders	Accumulative totals: Per cent
1 share each	1,971	6.5	1,971	6.5
2 shares each	1,791	5.9	3,762	12.4
3 shares each	1,048	3.5	4,810	15.9
4 shares each	797	2.6	5,607	18.5
5 shares each	3,599	11.9	9,206	30.4
6 to 10 shares each	7,049	23.3	16,255	53.7
11 to 25 shares each	7,022	23.2	23,277	76.9
26 to 50 shares each	3,687	12.2	26,964	89.1
51 to 100 shares each	2,001	6.6	28,965	95.7
101 to 200 shares each	821	2.7	29,786	98.4
201 to 500 shares each	349	1.2	30,135	99.6
501 to 1,000 shares each	69	0.2	30,204	99.8
Over 1,000 shares each	66	0.2	30,270	100.0
Total	30,270	100.0		

The extent to which people of all classes purchase the stocks of local utilities is also well exemplified by the great diversity in the size of holdings indicated by the foregoing tabulation, ranging from 1,971 holders of one share each to 66 holding blocks of over one thousand shares.

The attractiveness of issues of this character lies largely in the stability peculiar to this class of industry. Census figures show that 58.67 per cent of the population of the United States is dependent on the electric utilities alone for the necessities of domestic and commercial use, as well as for large power service for manufacturing and agricultural purposes. The use of gas for cooking and heating purposes is also an indispensable feature of modern domestic life, sales of manufactured gas in this country having increased at the average rate of over 10 per cent per annum for the past fifteen years. There is little prospect of overdevelopment in either the electric or gas industry, and the supervisory action of regulatory commissions, which precludes the issuance and sale to the public of worthless securities, furnishes an added assurance of safety.

The public utilities themselves naturally spare no effort to see that the securities which are sold to their patrons are made as safe as is humanly possible, since it would be courting disaster for a public service corporation, after broadcasting its securities among the local public, to have anything go wrong with the investment. Among the hundreds of millions of dollars' worth of securities which have been sold under the customer-ownership plan in the last ten years, the writer has yet to learn of a single company which has failed to continue its interest and dividend payments upon the issues disposed of in this manner. In this connection, the following excerpt from a review of "The Public Utility Field" by John Moody, New York analyst, who enjoys a national reputation as an impartial authority on investment matters, voices an opinion which is now quite widely held among people who are qualified to form an accurate opinion on the subject:

"The existing situation and future outlook confirm our endorsement of a year ago, expressed as follows: 'We have come to regard public utility securities taken as a whole as the most desirable and attractive class in the investment market today.' At the time that opinion was widely quoted by the press of the country; we reaffirm it today."

Vigilance Committee Urges Uniformity in Stating Mark-up.—In the interest of clarity and to protect some retailers from possible loss on merchandise through misconception of the margin available, the National Vigilance Committee of the Associated Advertising Clubs has issued a bulletin suggesting that all firms, in stating the mark-up available to the retailer, either figure the mark-up on the basis of the selling price of the merchandise, or clearly state that the mark-up advertised is figured upon the price paid by the retailer. The committee, with forty-two Better Business Bureaus in as many important cities and vigilance committees in many of the 320 local advertising clubs, is working for the elimination of deception from advertising. The bulletin of the committee states that, "In the interest of the merchant who endeavors to determine what his costs of doing business are, to promote clarity and to avoid provoking even the semblance of criticism, it is recommended that all advertisers, in making statements as to the margin or mark-up on an article of merchandise, either base percentage figures on the selling price, or state that the percentage is based upon cost, when that is the case; and it is further and especially recommended that traveling salesmen be instructed in this respect."

Records Show 1924 Was Year of Lowest Stream Flow in California

By H. D. McGlashan, M. Am. Soc. C. E.
District Engineer, Water Resources Branch, U. S. Geological Survey, San Francisco, Calif.

RECORDS collected by the Water Resources Branch of the Geological Survey in cooperation with the state and other agencies in California show that the water year ended Sept. 30, 1924, is the lowest on record for most streams in that state. Many of the smaller streams were dry, and on most large streams both the minimum and seasonal discharge were lower than that shown by any previous record, and had it not been for good administration of the available water supply and rigid conservation by users, serious economic conditions would have resulted.

The situation in the mountain areas was very serious. As a result of the deficient precipitation during the winter months and the long period during the spring and summer without rain, the fire hazard was greater than in many years. In California, during the first ten months of 1924, there were 1,920 fires, and 352,000 acres were burned over in the National Forests, and on state and private lands 590 fires burned over a total of 479,000 acres.

For the period 1911-1924 inclusive, the average number of fires per year in the National Forests of California was 1,083 and the average area burned over annually was 109,380 acres, or about one-half of one per cent of the total area. At this rate of burning it would take 186 years to burn over all National Forest lands in the state—about two generations of tree growth.

Because of this great fire hazard in the California National Forests, approximately eleven million acres were closed to all public use except under permit from the Forest Service; three million acres were restricted as to camping and smoking; while on five million acres there were no restrictions.

The precipitation records collected by the United States Weather Bureau show that the seasonal rainfall for the year ended June 30, 1924, averaged less than one-half normal. As a result, both ground storage and accumulated snow in the mountains, which are the two principal sources feeding the streams in California during the summer season, were at a minimum. Practically no rain fell during the summer months. Table I shows the precipitation at representative stations throughout California for the year ended June 30, 1924.

The extent of low water conditions as compared with previous years for various streams in the state is given in Table II. This shows that the annual run-off for 1923-24 varied from 1 to 66 per cent of the mean for all the years of record on each stream and averaged 25 per cent for the 20 streams covering three major drainage basins of the state. The run-off for 1923-24 was much lower than ever before recorded, except in the South Pacific drainage. A few of the stream-flow records in Table II are affected by some regulation for power purposes or by diversions for irrigation, but generally the comparison with other years on the same stream is good.

Information in regard to conditions early in the year indicated that the season would be a very critical one, and as a result there was a concerted effort on the part of all water users to conserve the supply and make the best possible use of the limited water available.

The Permanent Committee of the Sacramento and San Joaquin River Problems Conference, composed of thirteen officials representing navigation, railroads, irrigation districts, power companies and ranchers throughout the Sacramento and San Joaquin Valleys, took charge of the situation in the two valleys.

"In order to avoid litigation, strife and expense, to bring about the greatest possible conservation of water and to lay the foundation for the future settlement of difficulties arising from the use of water," this committee perfected an organization and appointed as water supervisor H. M. Stafford of the Division of Water Rights. He was instructed to measure the diversions and waste of water by all users and determine the amount of water flowing in the rivers at important points. In addition, he was charged with the duty of closely watching wasteful users of water and taking appropriate steps for the prevention of waste.

Station	July 1, 1923, to June 30, 1924	Normal July 1 to June 30	Per cent 1923-4 was of normal
	In.	In.	
Eureka	20.72	46.05	45
Red Bluff	12.02	25.03	48
Sacramento	7.99	20.09	40
San Francisco	11.62	22.27	52
San Jose	6.55	16.79	39
Fresno	5.24	9 68	54
San Luis Obispo	8.19	20.51	40
Los Angeles	6.67	15.64	43
San Diego	5.66	10.01	57

Table I—Precipitation in California for the year ended June 30, 1924, compared with the normal.

In San Diego County, the water supply was adequate on account of holdover storage in reservoirs and availability of ground water. San Bernardino, Riverside, Orange and Los Angeles Counties depend mainly upon ground water except in the area served by the Los Angeles aqueduct. The shortage of

River measurement station	Drainage area	Length of record	Mean discharge for 1923-24	Average annual discharge for entire record	Per cent 1923-24 was of average	Minimum previously recorded: Discharge	Minimum previously recorded: Year	Per cent 1923-24 was of previous minimum
	Sq. mi.	Years	Sec.-ft.	Sec.-ft.		Sec.-ft.		
Sacramento River Drainage Basin—								
Sacramento River—Red Bluff	9,300	29	4,100	12,500	33	5,380	1919-20	76
Pit River—Big Bend		13	2,100	3,160	66	2,390	1922-23	88
McCloud River—Baird	665	13	888	1,850	48	1,100	1919-20	81
Feather River—Oroville	3,640	22	1,640	6,870	24	2,830	1919-20	58
Yuba River—Smartville	1,220	21	610	3,380	18	1,490	1919-20	41
Bear River—Van Trent	263	19	31.9	493	6	121	1911-12	26
American River—Fairoaks	1,910	19	731	4,120	18	1,740	1911-12	42
Cache Creek—Yolo	1,230	21	8.22	629	1	3.94	1919-20	209
Putah Creek—Winters	654	17	53.2	556	10	58.7	1919-20	91
San Joaquin River Drainage Basin—								
Tule River—Porterville	266	23	25.5	157	16	40.4	1912-13	63
Kaweah River—Three Rivers	520	21	140	598	23	285	1911-12	49
Kings River—Sanger	1,740	29	539	2,510	21	1,220	1897-98	44
San Joaquin River—Friant	1,640	16	698	2,600	27	1,200	1912-13	58
Merced River—Exchequer	1,020	20	348	1,450	24	608	1912-13	57
Tuolumne River—La Grange	1,500	29	1,030	2,740	38	1,330	1897-98	78
Stanislaus River—Knights Ferry		26	344	1,720	20	512	1897-98	67
Mokelumne River—Clements	631	19	251	1,160	22	541	1911-12	46
Cosumnes River—Michigan Bar	525	16	55.6	532	10	176	1912-13	32
South Pacific Drainage Basin—								
Sweetwater River—Descanso	43.7	18	2.44	16.7	15	1.75	1920-21	139
Santa Ana River—Mentone	189	24	70.2	115	61	42.2	1903-04	166
San Gabriel River—Azusa	222	29	38.5	173	22	13.5	1898-99	285
Arroyo Seco—Soledad	215	23	22.8	192	12	19.7	1912-13	116

Table II—Stream flow in California for the year ending Sept. 30, 1924, compared with the average of all records and with previous minimum year.

water in these counties was due more to lack of power for pumping than to a decrease in the available supply.

The supply from Kern River was very short, and the water was prorated among the various users. Kings River run-off was so deficient that 40,000 acres normally irrigated from the stream received no water during 1924.

The Sutter Butte Canal Company receives its supply from the Feather River below the Western Canal Company's diversion. Its normal irrigated area of about 18,000 acres was reduced by 4,000 acres at the beginning of the season, on account of water shortage. At a large expense, temporary pumping plants were installed to recapture waste water from their drainage ditches. The Yolo Water & Power Company obtains its supply from the Clear Lake, Cache Creek drainage basin. This season they had practically no water for irrigation.

In other areas in northern California, where some storage has been developed, the situation was more satisfactory, and fair crops were reported. The most serious shortage in the San Joaquin and Sacramento Valleys occurred in parts of the San Joaquin drainage where no storage was available. The marked reduction in the area planted to rice in the Sacramento Valley helped somewhat to relieve the situation and, although the yield of most crops, including deciduous fruits, almonds, grapes and rice, was not so large as in previous years, the prices were uniformly higher, resulting in a larger net profit to the farmers.

On account of the large amount of hydroelectric power developed in California, the power situation was especially serious, and H. G. Butler, who acted as power supervisor in 1920, was reappointed to this position.

In southern California, a general reduction of 25 per cent, based upon the use during 1923, was ordered. This made it necessary to install many gas and oil engines both for pumping and for industrial uses. The use of electric lighting for advertising and display purposes was banned; street lighting was reduced to the bare requirements for safety, and street car systems in Los Angeles adopted the skip-stop system as a means of economy. Certain users were not allowed power, except during the night when their load could be carried by steam plants without interfering with more important uses of power. Considerable difficulty was experienced in enforcing these restrictions, and the net result was a saving of about 20 per cent.

Late in the season, with the reduction of the pumping load in the San Joaquin Valley, more power was available for southern California, and the restrictions for agricultural and industrial purposes were lowered to 15 per cent and entirely removed for domestic use.

All available steam plants, including many owned by municipalities and private parties which had not been in use for several years, were operated at full capacity 24 hours each day. The hydroelectric plants, except where the water was required for irrigation or would otherwise be wasted, were operated only during the peak loads.

The seasonal rainfall in northern California on Dec. 16, 1924, was slightly in excess of the normal and nearly double the precipitation on the same date in 1923. Conditions in this area are now much improved, as they affect agriculture and power development. In the remainder of the state the fall rains have been too light to afford much immediate relief.

The World's Largest Electric Chick Hatchery

By M. J. Brooks
Consulting Electrical Engineer.

SHORTLY after its old hatchery had been destroyed by fire, the Must Hatch Incubator Company of Petaluma, Calif., erected a new chick hatchery which is completely electrified. This hatchery is the largest electrified plant of its character in the world and has a capacity of 560,000 eggs at one setting. The accuracy of the temperature control in the electrified incubators has been a great factor in assuring the success of this hatchery, and the operators are of the opinion that electricity furnishes the most satisfactory heat for this purpose.

The plant of the Must Hatch Incubator Company during the busy season ships 25,000 baby chicks daily, and the normal production for the season is 3,000,000 chicks. These chicks are packed in cardboard cartons that hold 100 newly hatched chickens and are shipped by parcel post or express, without food or water, to Arizona, Oregon, Washington or Idaho, as well as California points, as the demand occurs.

The eggs are supplied locally from approved stock, and with a stream of chicks leaving the plant and a stream of eggs going in at the same time, the effect is that produced by a factory working at top speed. While some chicks are produced throughout the year, the heavy hatching season begins about the first of February and ends during June.

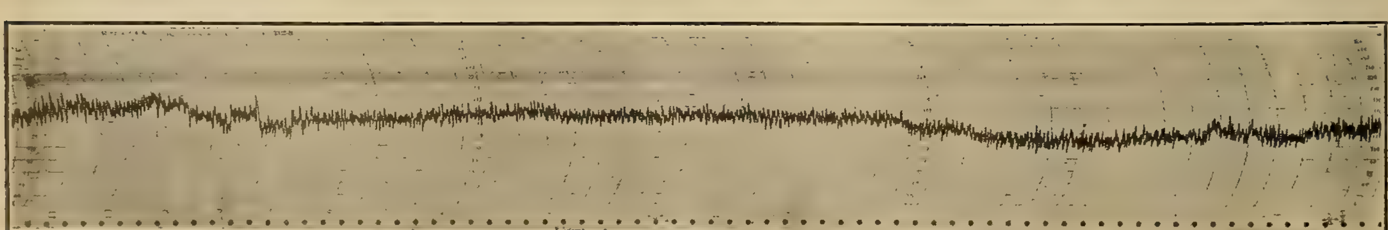
The plant consists of a hatchery, packing and shipping rooms, and offices in one building, which is of brick and hollow tile construction with asbestos composition roof, making it practically fireproof. It covers 26,784 sq.ft. of ground floor space, with provisions for expansion. The plant is completely electrified, and all wiring conforms to Underwriters' and California Safety Commission requirements. Water for all purposes is supplied by means of a motor-driven pump, automatically controlled.

Power is supplied by the Pacific Gas and Electric Company at 110 volts three-phase, through three 150-kw. transformers installed in a substation adjoining the incubator room. The substation is of hollow-tile construction, and also contains the main 110-volt switchboard, from which are run 20 three-phase circuits to care for the incubator load, and other circuits to care for the general lighting and small power load. The incubator load is divided into units of seven incubators which are handled by individual three-pole safety switches, while each incubator is controlled by its own thermostat which maintains a constant temperature of 103 deg. by cutting the power off and on as required. The load is so balanced that it is hardly possible to throw on any machines which will create an unbalanced condition. The 1,260 incubators are arranged in double-decked rows with working aisles between rows. Lighting is supplied from circuits over each aisle, controlled from either end of the aisle so that lights are burned only where and as needed.

The total load of the hatchery, as shown by the accompanying chart, is remarkably uniform throughout the twenty-four hours of the day. The highest peaks occur while the eggs are being aired during the morning hours, and the lowest, as might be expected, occur during the late afternoon when everything is thoroughly warmed up. The incubator room is not heated, but 53 kw. in heater capacity is installed in the offices and shipping room.

The use of electric power for hatching was not adopted without much careful study and experiment, but now that it has been accepted it has been taken without reservations, and when it is considered what a power failure of even a few hours would mean to this type of industry possessing no other standby source of power, it speaks well for the quality of service now being furnished by the California power companies that hatcheries are not hesitating to adopt the use of electricity for hatching purposes.

Because of the relatively constant demand the load is exceedingly satisfactory to the central station company, and every effort has been made to insure uninterrupted service to the electrified hatcheries. The accuracy of temperature control and the removal of fire hazards that are achieved through the use of electricity in hatcheries are only two of a number of factors that should make for the greater use of electric power in this industry.



Graphic meter record of hatchery load for 24-hour period.

TWENTY-FIVE THOUSAND chicks are shipped daily from the Must Hatch Incubator Company's plant at Petaluma, Calif., during the rush season. The exterior of the plant, which is of fire-proof construction, is shown at the right. A section of the incubator room, with 100,000 eggs being aired after one week's incubation, is shown at the left center and newly hatched chicks ready for shipment are pictured at the right. Transformer vault and switchboard controlling all circuits in the completely electrified plant are shown at the bottom.

An Experiment in Lifting Salmon Over High Dams

By John N. Cobb
Director, College of Fisheries, University of Washington.

MUCH interest has been aroused in the past year by the attempts of the electrical and fishing industries of the Northwest to solve the problem of getting fish over high dams in spawning rivers. Considerable future hydroelectrical development in the West depends on a satisfactory solution of this problem, and the success attained in the initial experiment on the White Salmon River, Washington, augurs well for such solution. In this article Professor Cobb reports on the experiment in full.

EVER since man first began to build dams and other obstructions in rivers, an adverse effect on the animal life of these rivers, notably the fishes, has been noticeable. In the case of the salmons, steelhead trout, sturgeon, shad, alewives, rockfishes, smelt, eulachon and other fishes that enter the rivers for the purpose of spawning and that represent some of the most valuable produce of our fisheries, this was especially noticeable, and it was readily seen that, if the damming of streams was to continue without providing a means of easy ingress and egress for the fishes, an immensely valuable natural resource would be destroyed. It should be noted that the value of the Pacific Coast salmon catch alone in 1923 amounted to some $60,000,000.

Since dams appeared to be inevitable, the thoughts of men naturally turned to the problem of getting fish over them. This problem was very much complicated, especially in the case of the salmons, by the well-known fact that these fish when ready to spawn return to the particular stream in which they spent the early months of their lives before going to the sea, and, if obstructed in their passage up this stream by some insurmountable barrier, beat out their lives against it.

A number of devices, commonly called fishways, have been invented during the past fifty years in the effort to solve this problem. In design these may be divided into four types as follows: (1) the inclined-plane type, in which a series of baffle or deflecting plates is so arranged in an inclined flume as to cause the water to follow in its descent a long, sinuous route; (2) the pool and fall, or step type, in which the water is brought down to a lower level by a series of short falls with intervening pools; (3) the counter-current type, in which the descending volume of water is checked by meeting a current opposing it at certain intervals; (4) the lock-and-gate type, in which a higher or lower level is reached through one or more locks operated by gates.

A few of the devices designed and installed have proved altogether successful; a few have been partially so, while a large majority have been absolutely worthless. In dealing with the Pacific Coast salmons it was early discovered that a fishway in a dam over 30 or 35 ft. in height was of little utility, due apparently to the disinclination of the fish to work their way up it to a height greater than this.

During the last decade the demand for electric power has been increasing at an enormous rate, and the abundance of hydroelectric possibilities on the Pacific Coast made it apparent that there would be considerable development of this power in the coming years. Hydroelectric development means high dams, and so, early in 1924 the writer called the attention of Dr. Henry Suzzallo, president of the University of Washington, to the matter, and recommended that a conference of the leading hydroelectric companies and the fisheries interests of Washington and Oregon, both state and private, be called for the purpose of determining whether there was not some common ground upon which all could get together in the endeavor to solve the problem. The writer's twenty-nine years' experience in the economic fisheries had convinced him that there was a possible solution. Dr. Suzzallo enthusiastically endorsed the suggestion, and the conference was called for the afternoon of May 14, 1924.

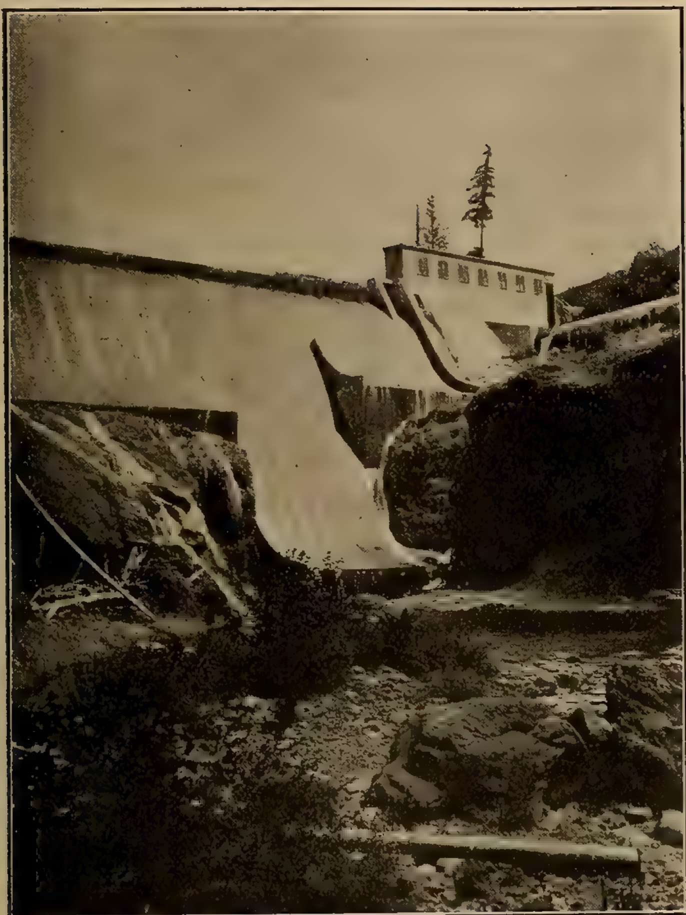
At this conference, which was well attended by representatives of the fishing interests and the power companies, it was determined to undertake some experiments in getting fish up and down over high dams, and a committee was selected to take up the work and endeavor to carry it to a conclusion. At the first meeting of this committee a smaller executive committee was chosen, and direct supervision of the work was entrusted to the writer.

Selection of Site for Experiments

As the first problem was to get the fish over a high dam, and as the conference had decided that the experimental work should be carried on at a dam in operation, the writer visited various dams in California, Oregon and Washington, and finally selected the Condit dam of the Northwestern Electric Company, on the Big White Salmon River, Washington.

This river, a tributary of the Columbia, is located in Skamania and Klickitat Counties and is about thirty miles in length. It is of the usual type of mountain stream, having a steep gradient with the banks occasionally narrowing into canyons.

The Condit dam is about four miles from the mouth of the river, while the power plant is a mile below this point, the impounded water being carried



Condit dam of the Northwestern Electric Company on the White Salmon River, Washington, where the experiments were conducted.

from the dam to the plant through a 13-ft. diameter wood pipe. The dam, which was built in 1911, is about 250 ft. long on the top and 164 ft. at the bottom. The top is about 121 ft. above the ordinary water level. Just below the dam and on the east side of the river is an overhanging rocky ledge, the top of which is 70 ft. above the surface of the pool at the foot of the dam. A line dropped straight down from a break in this ledge touches the upper side of a little bay cutting into the shores of the pool. This bay had been partly excavated during the construction of a fishway installed some time after the dam was built and later removed after the company and the Washington Fish Commission had come to an agreement regarding its removal.

As far as is known, the species of migratory fish frequenting this river are chinook salmon, Oncorhynchus Tschawytacha, and steel-head trout, Salmo Gairdneri. It is said that a very few silverside salmon, O. Kisutch, and dog salmon, O. Keta, also visit the river. The steelhead appears and spawns in the pools just below the dam during the months of April, May and the early part of June. The chinook salmon, and such other salmon as come into the river, run during the months of September and October. In September of each year the U. S. Bureau of Fisheries, which has a salmon hatchery on the Columbia River about a mile below where the White Salmon discharges into the main river, temporarily installs a rack a few hundred yards up from the mouth and holds all the salmon here until they are ripe. The fish are then seined and towed in live boxes to the hatchery, where they are stripped of the eggs, which are fertilized with the melt and put into the hatchery. When the young have been born and have reached the proper age, they are planted either in the Big White Salmon River or in Spring Creek, which furnishes the hatchery's water supply.

The reasons for selecting the Condit dam for the work in question were: the convenient shape of the dam and the banks below it for carrying on the work; the fact that there was available a run of migratory fish in the spring and another in the autumn, the latter of which could be utilized imme-

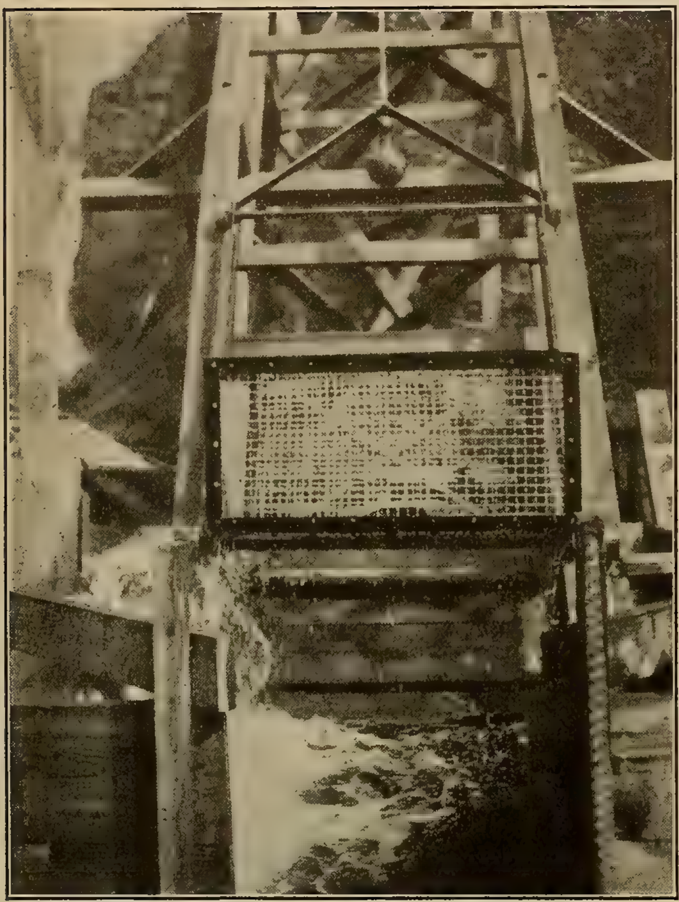
Fish hoist used in the experiments showing the basket about half way up the incline.

diately; and the accessibility of the dam to rail and other transportation facilities.

The Hoisting Device

For a number of years the writer has given much thought to the matter of fishways, and during the last three years has had abundant opportunities

to carry out various ideas in connection with his work for the Washington State Department of Fisheries. In connection with this work experience had taught him that salmon, at least, could not be trusted to work their way unaided through a fishway up over a dam more than 40 ft. high. With this in mind, it was felt that the only hope of finding a solution lay in the building of a mechanical device by means of



A closeup of the wire-mesh basket used in hoisting the fish over the dam.

which the salmon would be lifted artificially. In order to work out the details of this device, the Link-Belt Meese & Gottfried Company, Seattle, was consulted, and its resident engineer, R. S. Drury, was largely responsible for what success was obtained mechanically. The Northwestern Electric Company, through the cooperation of its general manager, L. B. Merwin, its chief engineer, O. L. LeFever, and David Shore, superintendent of the Condit plant, who had charge of the construction of the hoist, did all in its power to facilitate the experiment.

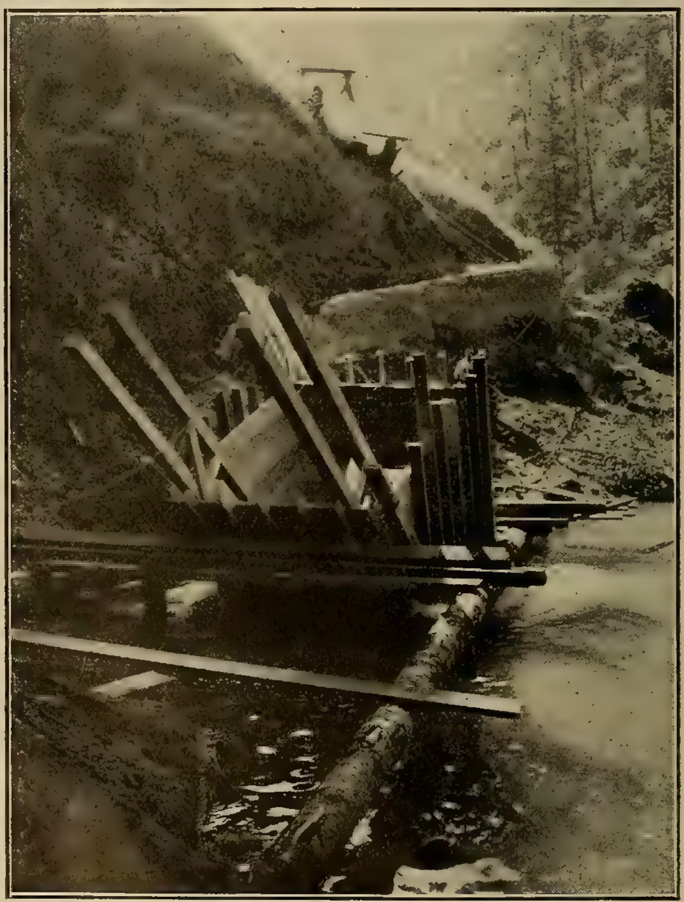
The device used was essentially a skip hoist with a basket or skip, 54 in. long by 60 in. wide, with a minimum depth of 2 ft. 6 in., running on an inclined track of approximately 62 in. gage. As it was to be merely an experimental device and to be removed as soon as the work was completed, but one basket was provided, and this was designed to be raised and lowered by means of a rope from the basket through a cast iron head-sheave to the hoist proper, with a 6-to-1 friction drive. A 5-hp. motor was used to operate the hoist. It should be stated that in building a permanent hoist a somewhat different method would be used.

A wire basket was used because the writer had come to the conclusion that it would be better for many reasons not to lift any water. This was another violent departure from precedent, but the experiment showed that it was a wise move. The basket was made of galvanized iron wire with 1½-in. mesh, this being a width sufficient to permit the basket to empty as fast as it rose from the water and to permit the small fish to escape readily.

Entrance to Fishway and Operation of Hoist

Since it would have been impossible to devise any apparatus competent to gather fish swimming freely in the pool at the foot of the dam, because of the size and depth of this pool, a large box was built to act as the entrance to the fishway. This box, which was made especially strong to withstand the pressure of the water to be enclosed in it, was 10 ft. wide, 12 ft. deep and 12 ft. long at the top and 8¾ ft. at the bottom. It was built on shore and launched into the water of the little square cove that had been the entrance to the old fishway.

As the idea was to induce the fish to jump from the pool into the box where they could be picked up



Closeup of box used as an entrance to the fish hoist showing method of anchoring.

by the basket, it was necessary to have a considerable volume of water flowing out of the spillway of the box. In order to accomplish this a flume was built from the face of the sloping dam to the box, with rude gates at its head so that the amount of

flow into the box could be regulated. Since the experimental device was built only to the top of the bluff, it was necessary to install a large box there into which the fish could be dumped from the basket.

Securing Fish for the Experiments

Due to the fact that at this season of the year the operation of the power plant requires most of the water in the river, there was not enough water flowing in the stream bed between the dam and the power plant to permit salmon to work their way up above the plant. It was necessary, therefore, to arrange otherwise for a supply of fish with which to experiment. This supply was obtained from the U. S. Bureau of Fisheries, which had agreed to furnish some salmon from their rack and corral at the mouth of the river. Accordingly, in order to transport these fish, there was fitted up on Sept. 22, 1924, a 1½-ton automobile truck with a V-shaped metal tank that had previously been used for hauling cement. A large sheet of heavy canvas was put inside the tank and the ends and sides carried to the top of the truck so that the water could not splash out and so that the salmon would be prevented from jumping or being thrown out.

The truck was driven close to the river bank and the tank filled with fresh water while the bureau's crew was hauling the seine inside the corral. When the seine was brought to the bank close to the truck, the medium-sized and smaller chinooks, the greater part of which were males, were picked out of the net and carried to and deposited gently in the tank on the truck. As soon as a sufficient supply had been taken in this manner, the truck was driven as speedily as possible to the nearest point to the dam, where, after being wrapped in a wet sack, each fish was carried down the three stairways, two ladders and a short distance along the pipe line and deposited temporarily in the tank of water at the head of the hoist on the bluff.

Method of Carrying On the Experiments

In all some seventy chinooks were brought up in the truck on Sept. 22 and 23, and a greater part of these were early sent down to the stream, part being placed in the entrance box and part in the corral. A few were held in reserve in the upper box on the bluff. Beginning early in the morning of Sept. 23, the writer kept close watch of the lower box. About the middle of the forenoon one salmon jumped into the box, and this was the only one seen to do this during the duration of the experiment, although possibly some may have done so during the night, which appeared to be the time of the greatest activity among the fish.

About 11 a.m. the basket was first lowered into the box and the real experiment began. It was drawn up five minutes later and one salmon was found in it. Several more lifts were made that morning with the basket submerged only one minute each time but without result. In the afternoon sixteen experimental lifts were made, with the basket submerged from one to thirty minutes, and in eight of these fish were caught. On one lift, when two fish had been caught, the basket was hauled to the top twice and the fish released into the lower box on the second trip down. Despite the fact that the fish had covered some 320 ft. in the journey, they were as lively when finally placed in the water as when they were first lifted out of it. Thus the main point of the experiment was conclusively proved—that if the fish could be brought together and caught they could be lifted almost any height within reason without any water and without any exertion or strain on the part of the fish.

On Sept. 24 the experiments were continued as on Sept. 23, and by varying the flow of water from the flume into the box and varying the speed of the basket, the effect on the fish in the box and in the corral was noted. Other variations in the manner of carrying on the experiments were tried and their effects noted, and all had a bearing on different aspects of the general problem, but the results need not be gone into here. During the experiments eleven fish died. Of these, seven jumped out of the upper box during the night, one was caught in the net over the lower box, two were found dead in this box with every appearance of having been killed by the basket hitting them, while one was found dead in the upper box when the water was drawn off.

Late in the afternoon of Sept. 24, the experiments were discontinued, the device dismantled and stored away pending its use next spring during the run of steelhead trout. At that time the water in the river will be high enough to permit the fish to swim up the river to the foot of the dam. It is also planned at that time to take up the other phases of the problem—the getting down of the young salmon and trout and the old steelheads that have survived the journey, and the devising of means of keeping the fish out of irrigation ditches.

Summary of Experiments

The experiments carried on as noted above developed the following facts:

1. That if the fish can be induced to enter such a fishway, they can be lifted almost any height desired.

2. That they can be lifted without water and that it was a decided advantage not to lift water, since out of water the fish's struggles were extremely limited, while if they had been in water some sort of cover on the basket would have been necessary to keep them from jumping out.

3. That in the majority of cases this method can be employed in getting fish over high dams, provided an experienced biologist, familiar with the habits of the fish to be lifted, is consulted before work on the dam is started. This is absolutely essential because certain precautions must be taken with the bed of the river, before and during the construction period, in order to leave the dam on completion in such condition that the fish will be persuaded to foregather in front of the entrance to the fishway or fish hoist.

CENTRAL STATION CONSTRUCTION OPERATION AND MAINTENANCE

Ground Current Control and Station Grounds

Grounds and Stray Current Control Are Important Points to Be Considered in the Design of a Power Station

By F. H. MAYER,
Electrical Designing Engineer, Southern California Edison Company, Los Angeles, Calif.

The question of the correct design and installation of station grounds is more generally misunderstood than any other electrical term used in connection with station layout. There is a wide difference of opinion in what constitutes a good ground. Most articles written heretofore have dealt principally with the surface area of plates or rods necessary for contact with the earth, and a special effort was usually made to show the best method and material to be used in order to obtain the least possible resistance from conductor to earth.

It is recognized that all these facts are important, but in view of the fact that these points have been thoroughly discussed it was thought not necessary to discuss this phase of the subject any further, but rather to take up the matter of station ground layout as it applies to power houses and substations.

There has been very little published on grounds and control of stray currents in station layout and therefore, as a result of such a condition, many stations are being designed and installed without the consideration that this part of the design should have. Often we read where instruments on the switchboard were burned out or some part of the building or the plumbing was damaged to considerable extent, all as the result of some electrical failure. This can be avoided to a large extent—at least, it can be confined to the area in which the failure occurred—if the correct design is adopted. This naturally suggests the question as to just what constitutes a good ground layout.

The author of this article is of the opinion that there must be five points satisfied, namely:

1. Will it protect human life?
2. Will it protect vital parts of the electrical equipment, such as switchboard apparatus, etc.?
3. Will it permit the equipment installed to function as it is supposed to; for example, lightning arresters and relays?
4. Will it keep the potential of the station down with relation to other stations in case of flashover to ground?
5. Will it protect the steel and concrete in the building where conductors of heavy carrying capacity are supported on the building structure?

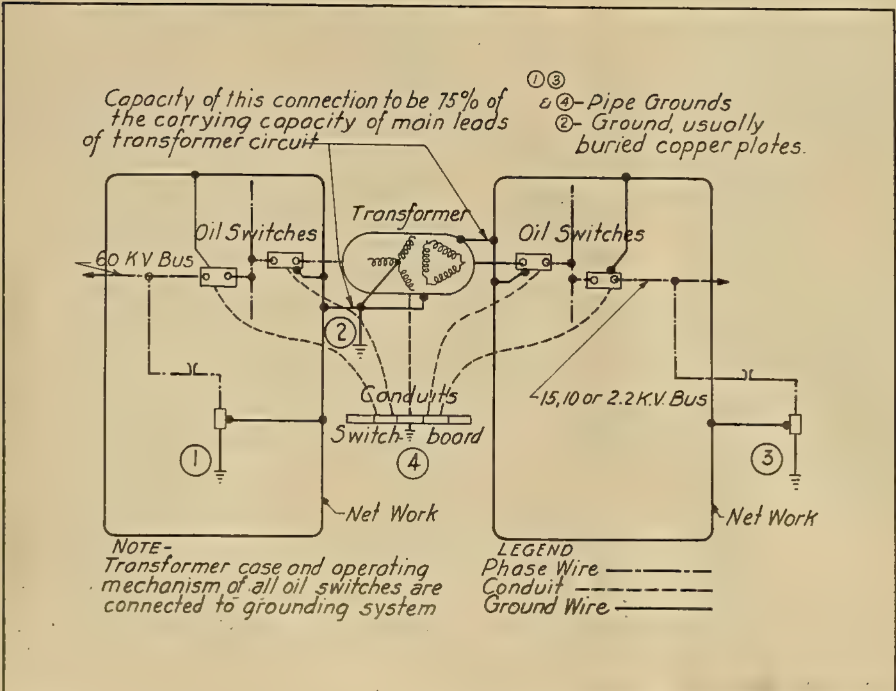


Fig. 1—Diagram showing ground control and grounds for 60/15-10 or 2.2-kv. substation.

In studying the above it is found that there are three fundamental considerations:

1. That the current on the occurrence of an accidental ground always passes, or tends to pass, from the point of failure to the generator, or transformer neutral, or a weaker point of insulation on the other phases.
2. That the potential gradient of an energized conductor when placed in the ground may possibly be quite pronounced.
3. That current will seek the path of least resistance.

In order to satisfy the first consideration, flashover from one phase to ground, foreign to the station, would havé its circuit satisfied by tying the power transformer neutral to a so-called ground well. However, for station trouble, due to the difficulty of getting a low resistance ground from rack to earth and from earth to transformer neutral, it was found more advisable to tie all steel to the neutral of the transformers by the use of metallic conductors. These conductors, leading from various parts of the station structure, tend to form a network which incidentally, if properly distributed, cares for the second consideration.

In order to satisfy the second consideration, it is necessary that the conductors be so distributed that a condition will be approached similar to that of a station that is built on a copper plate. Thus, upon the occurrence of a failure from any phase to the plate, the potential of the plate and the entire structure would rise simultaneously. Since the plate idea is not practical from an economic standpoint, it was found to be satisfactory if a network was laid in the soil immediately under the structure that is to close to the earth's surface, or near steel columns, so that the voltage gradient between steel and earth is maintained within safe limits over the area within reach of any part of the electrical equipment or steel structure. Therefore, pursuing this theory further, it naturally follows that all steel columns and apparatus within reach of the earth's surface must be tied to this network. The areas that are out of reach of any steel structure need not be cared for. A design of this sort will permit the grounding of the neutrals of high voltage transformers to their cases with absolute safety to the apparatus and operator.

While the network was designed to bring up the potential of the earth's surface simultaneously with the apparatus at the time of flashover, it is thought that, since there has been no high voltage experienced at Edison stations remote (but connected by telephone) from the station in trouble, the

area between the network and permanent moisture serves as a condenser and has sufficient condenser capacity to enable the entire station to remain very nearly at the same potential as that of the earth. This condenser action also serves as an excellent means of taking care of the high-frequency discharge from lightning arresters, while the low resistance of the network serves very well for carrying the low-frequency power discharge to transformer neutral which usually follows a lightning discharge.

The third and last consideration is very important. Since it is known that current will flow through the path of least resistance, it is evident therefore that, if certain equipment is to be protected, there must be provided a path of lower resistance than that which exists through that particular equipment. So far as the outdoor racks are concerned, this feature is automatically cared for, provided sufficient conductivity is supplied in the network. However, since equipments of different voltages are often remotely controlled by a single control board, as in Fig. 1, the conduit or lead sheaths on the control cables form a low resistance path, usually lower than that which is possible by grounding the equipment with two individual ground wells. So, in order to have the maximum assurance of safety, it is necessary to shunt out the switchboard; that is, connect the two networks with a conductor. This conductor should be made up of at least two cables, each about 75 per cent of the capacity of the transformer circuit, connected from one rack to the other. The two paths are desirable to insure at all times ample carrying capacity, should one cable for some reason or other become severed.

It naturally follows, then, that one ground well is usually sufficient. This ground well is placed preferably near the neutral of the power transformers. This is done for the reason that the ground well, as has been said, serves to collect current returning from failures foreign to the station, thus permitting the stray current to return to the transformer neutral without the necessity of passing through much of the network. In a station of large capacity where there are two sets of grounded neutrals, each for different voltage systems, such as in the case of 220 kv. and 60 kv., it is thought advisable to have two ground wells, each located near its respective group of transformers and, in addition to this, to add a connection between their respective networks similar to that mentioned above.

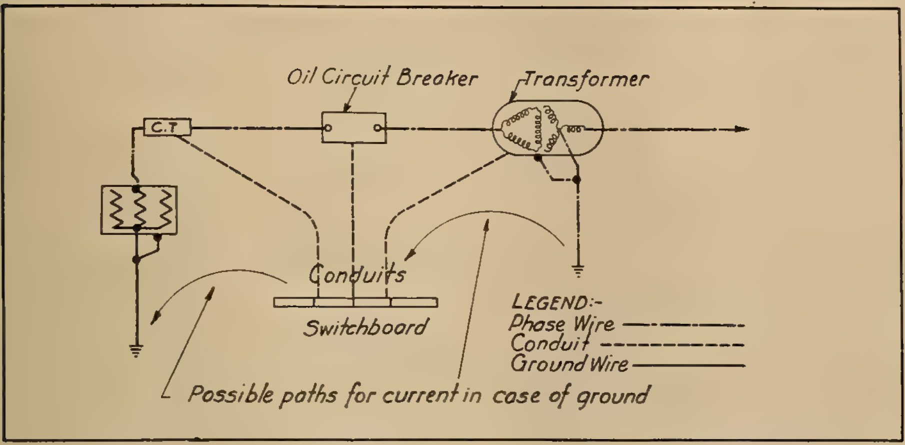


Fig. 2—Diagram of condenser or generator and power transformer with neutral grounded to earth. No metallic control.

Most of the foregoing discussion on ground current control and station grounds pertains to outdoor installations; however, for indoor installations the same general principles can be applied.

In stations where generators or condensers are installed, the matter of providing control for stray current is of prime importance, both from the standpoint of protecting the building structure and the secondary equipment. The usual practice is to operate generators and condensers of large capacity on grounded neutrals.

If the generator neutral and frame were grounded by the use of driven pipes or inserted plates and a failure should occur on the main leads to ground, it is evident that the current would satisfy its circuit by seeking the path of least resistance to the ground pipes, as in Fig. 2. This path may be through the building structure, or it may be by way of conduit, or both.

It has been the practice of some engineers to prevent the flow of this stray current through the building structure by insulating the steel as much as possible and, wherever it is impossible to establish gaps between steel, they specify that the steel should be welded.

The idea of insulating against voltages that are usually used in substations and generating stations seems impractical. It must necessarily be a tedious job, besides costly, to carry out such system of control. The most discouraging thing about such a scheme is that after all the precautions are taken it would seem that there still exists the uncertainty of not accomplishing what was set out to be achieved. On the other hand, even if it were possible to establish sufficient resistance through the building structure, there still exists the danger of an excellent return path being formed by the secondary wiring and its system of conduits. Thus for absolute protection to all equipment it would seem that there must be a path of extremely low resistance established independent of the building structure.

Before the general adoption of the modern method of relaying, it no doubt was preferable to isolate the bus as much as possible from ground, perhaps at the cost of safety of the secondary equipment. The operator was usually protected by rubber mats and other insulating materials placed in front of the control boards.

For the best operation of relays, especially for trouble at the station, such as differential protection of transformers and generators, it is important that a network of extremely low resistance be distributed in the proximity of the main bus and generator leads, thus creating those conditions under which the relays can function most efficiently for all cases of trouble.

A practical way of accomplishing this is to tie the neutral and frame of

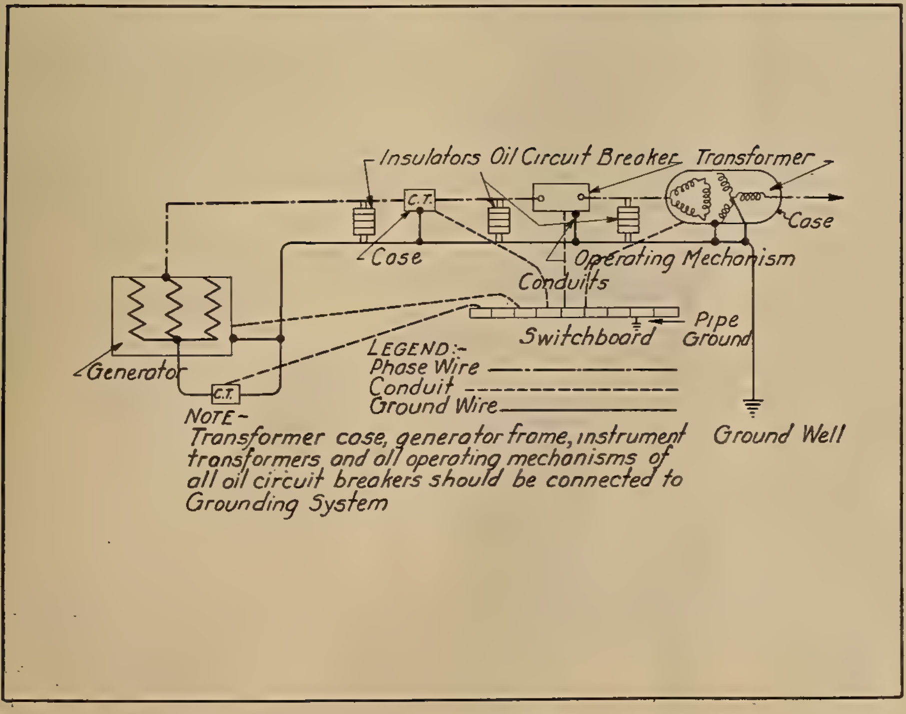


Fig. 3—Diagram of condenser or generator and power transformer with neutral tied to metallic control.

generator or condenser to a conductor of approximately 75 per cent of the carrying capacity of that of the main leads, extending this lead to all parts of the bus structure and, if the generator feeds a transformer bank, tying it also to the transformer cases, as in Fig. 3. If generator leads are carried in ducts, it is advisable to carry the ground control cable near the leads in a separate duct. On open bus work it is convenient to mount the bus supports on steel insert plates which are bonded to the ground-control cable.

If there are feeders off the generator bus, it is advisable to tie this network to a ground well or a series of driven pipes. On jobs where the generator is directly connected to transformers it is not necessary to establish grounds other than those which are usually established for the high voltage side.

As far as failures on the generator and the low-tension side of the transformers are concerned, the ground circuit is completed through the network and any connection to earth would be only incidental. Since the network on the high side of the transformers is grounded, the common tie between the two networks on the transformer cases makes further grounding unnecessary.

The switchboard equipment, such as grill work, pipe framework and instrument cases, should be tied together and run to a comparatively high resistance ground located just outside the switchboard control room. This ground usually consists of a few pipes driven into the earth.

The object of isolating the control-board ground is to establish a higher resistance through the control board to ground than that which exists through the network.

The foregoing principles were adopted and applied on the Edison 220-kv. program and are now being applied on all of the new substation designs. Previous to this, little time was given to the correct analysis of the ground design and, as the result, some difficulties were experienced.

The fact that during two years of experience with 220 kv. there has not been the slightest indication of high voltage on the non-current carrying structure leads the author to believe that the foregoing principles are very nearly correct.

Card System Used for Protective Equipment Records

Adequate records pertaining to the operating history of all protective relay equipment on a system are essential to the satisfactory operation of this equipment. The old, original system, if it may be graced with that title, was purely a cut-and-try proposition, and no records of any consequence were kept covering the operating history of the equipment that will be an aid to judgment in making subsequent changes in settings and adjustments.

Under present-day operating conditions immense blocks of power are involved, and systems are necessarily complicated by interconnection and parallel operation. It is of value to the protection engineer to be able to refer to a card and tell at a glance just what different settings and current transformer ratios had been in service on some particular circuit and just when they had been changed. Knowing this and knowing in a general way what the system operating conditions have been at various times, it is possible to make a more judicious selection of a setting to accommodate whatever new conditions may be arising, or to correct unsatisfactory operations.

The Southern California Edison Company's protection engineering department has devised and standardized for this purpose the forms pictured in this article. The two forms shown are printed one on each side of a standard 4x6-in. file card, and are designed to contain not only information concerning the automatic protective equipment but all other information concerning any one particular circuit that might be of interest or value for future reference.

One card is used for each separate circuit at each station, except in those cases where two or more sets of protective relays are in service on one circuit as would be the case, for example, where a transformer bank was protected by both overload and differential relays. In cases where there are two or more sets of relays on one circuit a card is made out for each set.

In order to facilitate selection and segregation, cards of different colors are used for lines or circuits of different voltages. Blue cards are used for

FORM G.O. 71. 1924
SOUTHERN CALIFORNIA EDISON COMPANY

PROTECTIVE EQUIPMENT RECORD

STATION____ CIRCUIT____ PROTECTION____
KV.____ CYCLES____ KVA____ AMPERES____ % IMP.____ CIR. BR. OP TIME____
CIRCUIT BREAKER:____ TYPE____ KV.____ AMPS.____ RUPT. CAPY.____ AMPS. AT____ KV
CUR. TRANS:____ TYPE____ KV____ VA.____ RATIO____ CONN.____
POT TRANS:____ TYPE____ KV.____ VA.____ RATIO____ CONN.____
RELAYS:____ TYPE____ VOLTS____ AMPS.____ SECONDS____ TRIP.____ CONN.____
STYLE NOS. A____ B____ C____ REACTORS:____ KV.____ %____ AT____ AMPS.
AUX. RELAYS____ TYPE____ NO. CONTACTS____ BATT. CHRGR.____
LTG. ARRESTER:____ TYPE____ KV.____ GAPS: S____" H____" G____" BATT.____ VOLTS

	REMARKS
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
	(OVER)

Face of relay and protective equipment record used by the protection engineering department of the Southern California Edison Company. It is obvious that every space would not be filled out for any one circuit, but sufficient spaces are provided to make the one form usable for any installation. A space is provided for the recording of circuit breaker operating time, as it is planned to determine experimentally the actual operating times of the different classes of breakers in service as an aid toward securing selectivity with minimum relay time difference between adjacent stations. Spaces are provided for relay style numbers but not for relay serial numbers, as it was found that, from an operating standpoint, the style numbers were more valuable in identifying relays.

RELAY SETTINGS

	SETTING DESIRED						SETTING OBTAINED								REMARKS
	DATE			C. T. RATIO	CUR. TAP.	TIME SECS.	DATE			MIN. TR AMPERES	CUR. TAP.	SECONDS AT		C. T. RATIO	TIME–SECS. TO CLOSE RELAY CONTACTS
	MO.	DAY	YR				MO	DAY	YR.			300%	1000%		
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															
16															
17															
18															
19															
20															

Reverse side of protective equipment record card used by the Southern California Edison Company showing the spaces provided for entering twenty successive changes in settings. Under ordinary operating conditions a card will last several years, thus affording a continuous historic record. When a letter requesting a change in setting is sent to the test department, the data are entered in the space under "Setting Desired," and when the report of the completed test comes back from the test department the information on it is copied into the space under "Setting Obtained." Both entries are found to be necessary, for sometimes field conditions prevent the making of the actual setting requested.

circuits of 150 and 220 kv., salmon-colored cards are used for 30- and 60-kv. circuits. Buff-colored cards indicate 11,000- and 15,000-volt circuits, while for everything under 11,000 volts a white card is used. Of course the voltage ratings given are merely nominal ratings.

When these cards were installed as the official record of protective equipment, great effort was made to make them immediately as valuable as possible. Old records, consisting of report sheets from the test department, correspondence and the less complete cards that previously had been used were carefully gone over, and all settings which could be verified satisfactorily were transferred to the new cards. An effort was made to obtain wherever possible a continuous record dating back to the time that the circuit was installed, or at least back to the time when the circuit assumed prominence or was equipped with induction relays, as the case might be. Previous cards had contained only current information, and it had been necessary to do more or less research work every time it was desired to find information concerning previous settings.

The work involved in establishing a complete file of these new cards covering practically every circuit on the system was heavy and tedious. Nevertheless, its worth has been proved, and the design is such that the work necessary to keep the cards up to date has been reduced to a minimum.

Posting Meter Constants Helps to Maintain Confidence

By W. T. RYAN,
Industrial Engineer, The Washington Water Power Company, Spokane, Wash.*

In our contact with our customers, particularly those who use power for industrial purposes, we have noticed frequently the suspicion with which they regard electricity and any individuals who deal with the subject. Such a state of mind is usually evidenced by questions raised in regard to our bills and rates. It is easy to help the customer to understand how his bill is figured and how the cost per kw-hr. can be decreased by a greater number of hours' use of a given demand, but it is a serious mistake to stop there. At that point the big thing in his mind is the amount of money in dollars and cents that he is paying to us each month. We must go further; we must create in his mind a definite conception of what he is receiving for his money, and of its value to him as measured in useful work performed in his plant. Having established such a conception, it is easy to take one more step and make the customer feel that our principal concern is not what we can get out of him, but rather how much we can give him for his money in the way of service.

As a means to this end we have been furnishing the more important customers with a blue print, reproduced herewith, which gives all the data necessary to enable anyone to read the meters and to calculate the load in horsepower at any time desired. This is posted near the meters, and the method of making the computations is thoroughly explained to the man in charge. This places us in the position of having laid our cards on the table.

By giving such information on simple, fundamental ideas in mechanics and electricity, the customer's resistance can be overcome, and after his doubts and suspicions have been removed it is possible to establish his confidence in our company.

Name of Customer

....

DIRECTIONS for Determining Kilo-volt amperes (K.V.A.), Kilowatts (K.W.), Horse Power (H.P.), and Power Factor (P.F.).

From Graphic K.V.A. Meter # ..15......

Chart Reading x ..80.. = K.V.A.

From Integrating K.W.Hr. Meter # 4329...

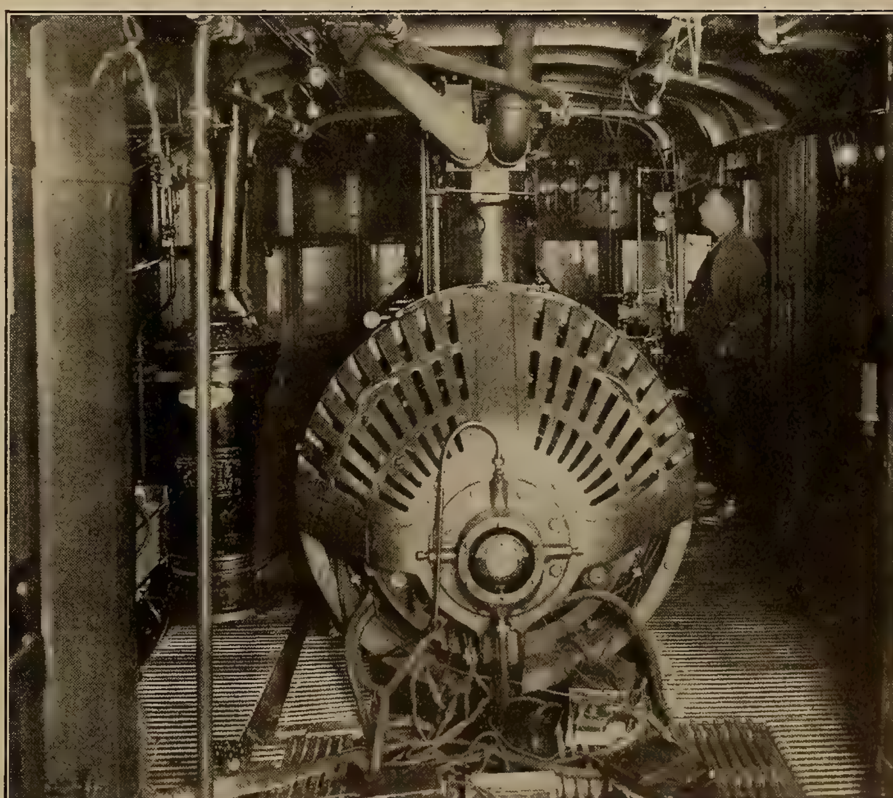
$\frac{\text{No. Rev. of Disc}}{\text{Time (in Sec.)}}$ x 3.6 x ..144.. = K.W

$\frac{\text{K.W.}}{0.746}$ = H.P.

$\frac{\text{K.W.}}{\text{K.V.A.}}$ = P.F.

The Washington Water Power Co.

Showing blue-printed form used by the Washington Water Power Company to acquaint customers with meter constants



Interior view of new oil engine electric locomotive showing 200-kw. generator direct connected to 300-hp. oil engine. The locomotive, designed for switching purposes, was built jointly by the General Electric Company and the Ingersoll Rand Company.

*Extract from paper by W. T. Ryan, industrial engineer, The Washington Water Power Company, Spokane, Wash., read at employees' meeting.

IDEAS FOR THE CONTRACTOR

Home-Lighting Program Presented to Parlor Club

Unusual Demonstration and Exhibit Staged by California Dealer Proves Big Success and Builds Business

BY J. U. BERRY
Advertising Manager, Valley Electrical Supply Company, Fresno, Calif.

On Nov. 20 the Valley Electrical Supply Company, Fresno, Calif., staged a home-lighting program for the ladies of the Parlor Lecture Club. The lecture was unique in character and presentation.

H. E. Cook, lighting specialist from the Lighting Service Bureau of the Edison Lamp Works of the General Electric Company, Schenectady, N. Y., was retained to deliver the lecture. His address proved intensely interesting and educational and was followed by much favorable comment from the audience.

The stage in the auditorium of the Parlor Lecture Club was specially decorated for the occasion. Wall brackets mounted on wall board plaques, which were covered with wall paper, were suspended from the moulding of the back wall of the stage. These were hung in front of strips of dark red velour which was draped from the moulding to the floor, lending an artistic and pleasing effect. One of the wall brackets was shown without shades and the other with parchment shields in order to make a comparison of glaring lights with that of shaded soft and restful light.

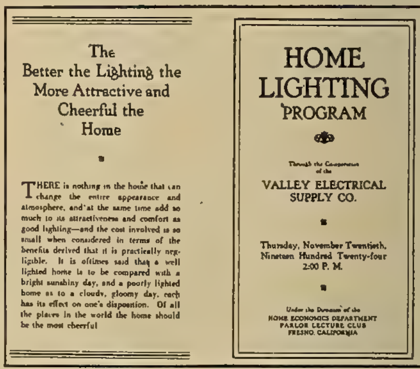
Suspended from the ceiling in the center of the stage directly over a dining table, spread with a white cloth, was a beautiful decorative glass-dome dining-room fixture to illustrate the correct lighting of the dining table and room. On each side hung candle fixtures, one with glass shades showing the absence of glaring lamps, the other without shades, emphasizing glare. On the right-hand side of the stage was an easel with lighting charts which Mr. Cook used in illustrating his talk on home lighting. The charts consist of pen and ink drawings taken from actual home settings where both correct and incorrect fixtures were in use.

The left-hand side of the stage setting consisted of a floor lamp with silk-lined fringed shade and a special rack with an assortment of glass shades in the very latest designs and shapes. Both frosted and colored lamps were used with these shades to show the various lighting effects obtainable. In the floor lamp a frosted lamp was shown, together with a clear lamp. Here Mr. Cook pointed out to his audience the desirability of using the frosted lamps, since it was possible to see the filament of the clear lamp even through the silk lining and fringe of the shade.

After the conclusion of the talk, an open discussion brought out many interesting phases of home lighting, and numerous questions were answered by the speaker.

Several musical numbers and refreshments were features of the program. So successful did this meeting prove that it has led us to making plans to put on a similar educational campaign on a much larger scale in the near future.

Though most people use electric lights every day, but few have any conception of what real lighting comfort is or means to them. Therefore it is felt that in staging a home-lighting educational campaign on a larger scale it will result in a much better understanding on the part of the housewife as to the proper types of lighting adequate to home needs.


The
Better the Lighting the
More Attractive and
Cheerful the
Home

THERE is nothing in the home that can change the entire appearance and atmosphere, and at the same time add so much to its attractiveness and comfort as good lighting—and the cost involved is so small when considered in terms of the benefits derived that it is practically negligible. It is oftimes said that a well lighted home is to be compared with a bright sunshiny day, and a poorly lighted home as to a cloudy, gloomy day, each has its effect on one's disposition. Of all the places in the world the home should be the most cheerful

HOME
LIGHTING
PROGRAM

VALLEY ELECTRICAL
SUPPLY CO.

Thursday, November Twentieth,
Nineteen Hundred Twenty-four
2:00 P. M.

HOME ECONOMICS DEPARTMENT
PARLOR LECTURE CLUB
FRESNO, CALIFORNIA

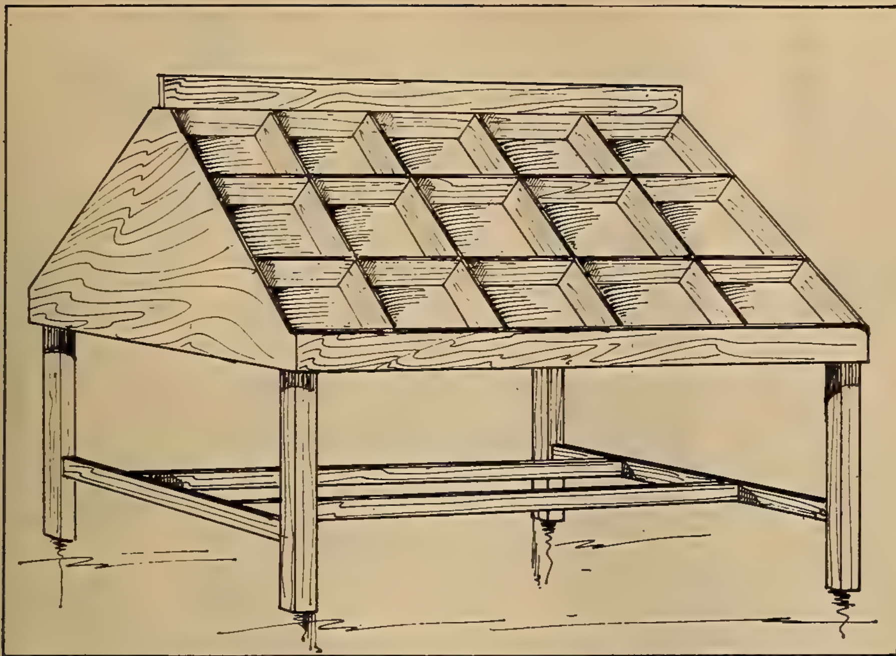
Program used by Valley Electrical Supply Company at lighting demonstration exhibit before Parlor Lecture Club.

Demonstration exhibit used by the Valley Electrical Supply Company, Fresno, Calif., at the auditorium of the Parlor Lecture Club of that city, to show the value of good lighting and to illustrate the adaptability of various types of lamps and fixtures.

The important factor in the success of a program of this character is proving to the hearers that it is not necessary to sacrifice harmony and decorative beauty in the selection of lighting fixtures in order to effect economy and obtain the desired comfort-giving lighting results. Such a program may be staged to advantage by electrical dealers everywhere and form an excellent follow-up of the Better Lighting Contest recently conducted.

A Handy Yardstick for Measuring Lamp Cord or Small Wire

Many dealers have been bothered to find a handy method of measuring silk lamp cord and the smaller sizes of wire, such as are often sold in small quantities. One convenient way to measure this stock is to mark off on a shelf or counter, or even on the top of a drawer, half-inch measurements up to one yard. This permits of measuring the wire without removing the spool from the drawer or rack and helps to keep the stock in good order. It also speeds up the service to the customer and thus more quickly releases the clerk for service to others.



Handy display case for showing smaller and more commonly used electrical devices. Label holders may be used and cards inserted showing the name of the device and its price. This display case may be made at very little expense from an old table and forms an excellent sales help for increasing volume on fuses, attachment plugs, sockets and other small items.

Take a Lesson From the Ten-Cent Store Merchandiser

The ten-cent store sells its merchandise because it is continually on display and because the prospective customer can see what he intends to buy. Also he sees many items that he can use but which have not occurred to him as needful purchases until he sees them on display while passing through the store. A merchandising help adopted by this type of store is the table display. This display is merely an arrangement of small bins on top of a table, each bin containing a different item and all items clearly marked as to price. This offers an excellent means of displaying small electrical goods, such as sockets, attachment plugs, two-light clusters, etc. If the goods are marked with their name and price, the customer is able to know the designation of each article in which he is interested and also to see in advance what it will cost. If the price is agreeable, the sale is made in his mind without effort on the part of the clerk.

This type of display has worked out well for many electrical dealers and has been the means of increasing many fold their sales of fuses and other smaller devices in common use in the household.

Typical job sign designed by Walter F. Price, executive secretary California Electragists, San Francisco, Calif., for the exclusive use of members of that association. These signs may be used only by Electragists and are sold to members at low cost.

National Electrical Code to Be Issued Again in 1925

There will be a 1925 edition of the National Electrical Code, the rules and regulations for electric wiring and apparatus. This was determined at a meeting of the reorganized sectional electrical committee of the National Fire Protection Association, held in New York City on Friday, Nov. 21, 1924.

Inspection and regulatory bodies, manufacturers, utilities, property owners, users or others who have proposals for additions or other amendments to the National Electrical Code, edition of 1923, can be assured of full consideration if these proposals are submitted in writing to the chairman of the committee, A. R. Small, 109 Leonard Street, New York, N. Y., not later than Dec. 15, 1924. Such proposals should preferably refer to a particular article and paragraph of the 1923 edition, and shall in all cases be readily identifiable as to the name, address and interest of their submitters. When so filed, such proposals will be referred at once to the appropriate article subcommittee for detailed study. The sectional electrical committee will meet Feb. 17, 18 and 19, 1925, to receive and act upon reports from the article committees and to determine upon its report to the annual meeting of the National Fire Protection Association to be held in Chicago, Ill., in May.

Electragists Elect Members of Executive Committee

The following members of the Association of Electragists International have been elected executive committeemen:

Eastern division—W. Creighton Peet, New York City (one year).

Great Lakes division—Ernest McCleary, Detroit, Mich. (one year).

Southern division—Joseph A. Fowler, Memphis, Tenn. (two years).

Central division—A. Penn Denton, Kansas City, Mo. (two years).

Mountain division—E. C. Headrick, Denver, Colo. (one year).

Pacific division—Clyde L. Chamblin, San Francisco, Calif. (two years).

Western Canadian division—J. H. Schumacher, Winnipeg, Manitoba (one year).

Eastern Canadian division—R. A. L. Gray, Toronto, Ontario (two years).

The election occasioned only two changes in the committee's personnel, Ernest McCleary succeeding Leslie G. Ross, Superior, Wis., as the representative of the Great Lakes division, and J. H. Schumacher succeeding C. C. Carter, Vancouver, B. C., as representative of the Western Canadian division.

Make Your Wiring Jobs Advertise and Create Future Sales

One means employed by many progressive contractors to secure leads and future business is to place a tag on the fuse board or on the fixtures of every job they wire reading in substance as follows: "This building was wired by Blank Electric Company. For future electrical supplies or wiring call them at telephone number 123."

This tag may be either of etched metal screwed to the meter board or may be of cardboard fastened on with a string. It has often proved of value in bringing in inquiries that have led to the sale of appliances, additional outlets and other electrical devices.

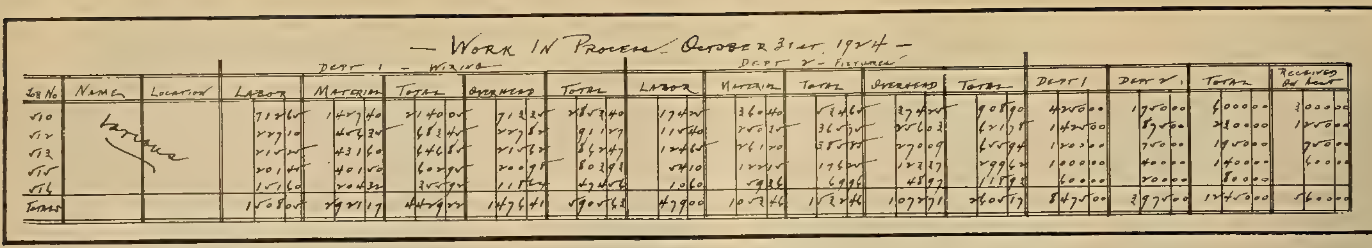


Fig. 1.

Practical Accounting for Contractors and Dealers

BY F. V. MITCHELL

Fig. 1 contains an illustration of the Work in Process Statement prepared at the end of the month, as outlined in the Aug. 15, 1924, issue of the Journal of Electricity. The totals appearing on this statement are used in the compilation of the Summary as outlined in Fig. 2. The preparation of this form was also thoroughly explained in the Aug. 15, 1924, issue.

The following monthly closing journal entries are made from the totals appearing on accompanying Summary.

Description	Acct. No.	Dept. No.	Dr.	Cr.
Cost of Goods Sold—Material	52A	1	$2,719.12	
Cost of Goods Sold—Labor	52B	1	1,496.15	
Work in Process Account	15	1		$4,215.27
Material and labor cost of wiring jobs finished during October, 1924.				
Cost of Goods Sold—Material	52A	2	930.95	
Cost of Goods Sold—Labor	52B	2	471.20	
Work in Process Account	15	2		1,402.15
Material and labor cost of fixtures jobs finished during October, 1924.				
Cost of Goods Sold—Overhead	52C	1	1,405.09	
Cost of Goods Sold—Overhead	52C	2	981.51	
Work in Process Account	15	1		1,405.09
Work in Process Account	15	2		981.51
Overhead on wiring and fixtures jobs finished during October, 1924.				

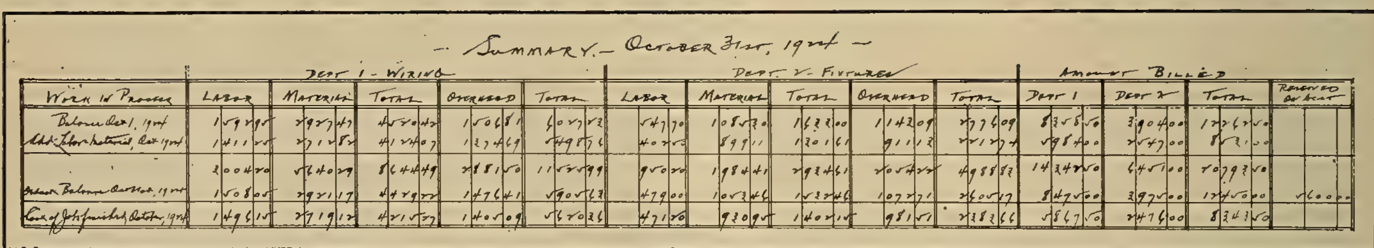


Fig. 2.

This Dealer Carries His Store to His Customers' Homes

An electrical contractor-dealer, located in a small Western town, whose business is largely done in the country and with ranchers and others far from town, has adopted a novel and successful scheme for increasing his sales. He has taken a small light truck of popular make and has fitted up a special cabinet arrangement for containing various small appliances that sell readily in his store. His stock on the truck consists of electric irons, toasters, a popular-priced percolator, extension cords, sockets, attachment plugs, Mazda lamps of all of the most popular sizes, and circulars of other devices. He never leaves his store without a complete assortment of goods, and he seldom returns without having made a sale. In addition to the stock carried on the truck, the circulars help him to sell washers, vacuum cleaners, ranges, pumping outfits and other heavier devices. Lately, by carrying a radio set and batteries for its operation, he has worked up a considerable volume on this line and this has been done with scarcely appreciable increase in overhead expense. The delivery expense may be considered as very low, as the truck would have to make the trip for other business, and the goods are delivered right from the truck.

The sales of lamps from this truck have nearly paid the fuel and oil costs, and this dealer feels that he has not yet reached his maximum possible volume. During the period just before the holiday season he carries samples of special merchandise, such as portables, and literature on floor lamps and toys, as well as other merchandise that is especially of a holiday nature. Electric range sales have been made as a result of having descriptive circulars on the truck, and more than one pumping outfit sale is attributed to the same procedure.

Dealers who are similarly located may be able to profit by this plan, which has the advantage of requiring very little investment in truck equipment.

Do You Sell Radio Engineering or Radio Entertainment?

Radio is necessarily a highly technical subject, but the customer is not ordinarily interested in its technicalities. All he wants a radio set to do is to work satisfactorily and with the least manipulation. Too many dealers are selling wave lengths, regeneration and construction of circuits rather than the service and pleasure that radio can bring. Prospective customers become confused at the use of a lot of technical terms that they do not understand and turn away without buying, feeling that a radio set is too complicated for them to handle. Dealers who sell the service of a radio set and not its technicalities are benefiting in sales volume, while those who deal in engineering terms are impeding their own progress on this line.

A Device for Plugging Up Holes in Knock-out Boxes

Electrical contractors have often found it necessary to plug up the knock-out hole in switch boxes. In the past it has been common practice to take two pieces of tin and fasten them together, one on each side of the box, thus covering the hole. This necessitated drilling or punching two holes and fitting a bolt for reassembling, all of which involved considerable time and added to the cost of the job. A new device to take care of this feature of electrical construction has been brought out by J. J. Duck, Los Angeles, Calif., and is sold under the name of Duck snap-in blanks. The device is a metal stamping with spring edges, so constructed that all that is necessary is to snap the duck into the blank hole. Ducks are furnished in one-half and three-quarter-inch sizes to fit standard openings and knock-out boxes.

Front, back and side views of duck for snapping into holes and knock-out boxes.

L	T	■	C	H	A	R	G	E	■	D	T
A	■	F	■	B	C	A	R	■	E	■	A
M	H	O	S	■	B	D	■	S	N	A	P
P	A	R	■	Q	U	I	T	■	G	P	S
■	■	M	I	S	S	O	U	R	I	■	■
S	H	U	N	T	■	■	B	A	N	K	S
E	E	L	■	■	■	■	■	■	E	V	E
M	■	A	M	P	E	R	A	G	E	■	P
A	I	E	E	■	P	I	■	A	R	E	A
P	R	■	G	R	O	V	E	S	■	Z	R
H	■	N	■	■	C	E	■	■	S	■	A
O	P	E	N	■	H	T	■	B	E	L	T
R	■	G	U	Y	■	■	O	U	T	■	O
E	E	■	T	R	U	N	K	S	■	R	R

Answer to cross-word puzzle, devised by Claude W. Mitchell, electrical engineer of the Board of Fire Underwriters of the Pacific, and published in the Jan. 1 issue of the Journal of Electricity.

Prices Clearly Shown on Tags Help Appliance Sales

Most people like to know the cost of an article in which they are interested. It is only human nature to want to be able to pick up a percolator or toaster or other electrical appliance and to know without asking what its selling price may be. Many dealers have taken advantage of this fact and have made wide use of price tags, but there are still countless stores wherein it is necessary to ask the price of every article in the place. This often causes embarrassment to the prospect and not infrequently acts as a sales impedance, for there are many persons who will not inquire. Every such one means the loss of a possible sale.

Price tags are very low in cost and very high in value, especially if the prices are plainly marked in figures and not in code. Wherever code is used a feeling of distrust and suspicion is liable to be occasioned and the prospect's feelings are liable to be hurt. Many manufacturers furnish, at extremely low cost, price tags that bear on one side an advertisement of their goods and on the other side have provision for showing the selling price of the article to which attached. Such tags not only help to sell the appliance or device to which attached, but they also serve to create interest in the article advertised. These tags are often furnished in unique and distinctive shapes and colors and thereby lend an added attraction to the display.

San Francisco Contractors Will Hold Annual Dinner

The San Francisco Association of Electrical Contractors and Dealers will hold its annual dinner at the Hotel Whitcomb, San Francisco, Calif., on the evening of Saturday, Jan. 17, at 6:30 o'clock. The dinner will be entirely informal, and the usual care has been taken to make the affair successful. Arrangements are under the direction of the following committee: Gus Baracco, Victor Lemoge, Ed Dowd, Walter Mobley and Dave Carson. The attendance this year is expected to exceed that of any preceding year, and an exceptional program has been provided by the committee.

A Piece of Black Velvet Helps in Appliance Sales

One big help in appliance sales is a piece of black velvet for spreading on the counter under the appliance to be shown. The sharp contrast between the highly polished nickel of the appliance and the black sheen of the cloth shows off the appliance to excellent advantage and adds to its attractiveness. It is desirable to show only one appliance at a time; that is, if a customer asks to see a percolator and then wants to look at a toaster, the percolator should be placed back on the shelf before the toaster is displayed. This prevents an appearance of littering up the display counter and removes the liability of confusing the customer. Many sales are lost by promiscuous scattering about of appliances.

Another big help in maintaining the neat appearance of electrical appliances is a small piece of soft chamois. This should always be used to remove the perspiration and grease after showing the device and to polish appliances daily. Appliances retain their finish better when they are kept in glass-enclosed cases as they are then less exposed to dust and to atmospheric action.

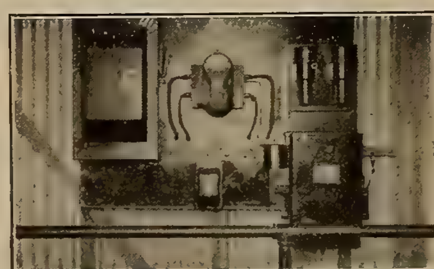
Agricultural Wiring Conditions Show Notable Improvement

Although electricity has been used extensively in agriculture for several years, it is only recently that consistent attention has been paid to the matter of installation methods. In the earlier days it was not uncommon to ignore all of the ordinary hazards attending elec-

Early installation in pump house. Note exposed switch and danger signs.

trical installations, and exposed terminals were the common practice. Increased use of electric energy and the advance in the contractor-dealer's art have brought about many improvements in installation conditions, and today the normal agricultural installation is of as high quality as can be found.

The accompanying photographs illustrate the different standards of installation employed in California agricultural applications. The improvement has been occasioned by the combined work of



Recent installation on a California ranch. Note the extreme safety and lack of possible contact with hot wires or terminals.

the central station, manufacturer, contractor-dealer, jobber and the California Electrical Cooperative Campaign. The recent installation pictured herewith is marked for the number of safety items taken under consideration. All switches are of the enclosed type, and wiring is in accord with all safety requirements. Protective relays are provided, switch boxes may be locked, and there are no exposed terminals. Perfect safety attends the operation of this installation and personal and fire hazards have been removed.

BETTER MERCHANDISING

Selling Kitchen Lighting Units in the Spring

British Columbia Electric Railway Company Places Over 4,000 Units Despite Unusual Conditions

Proving that a kitchen lighting unit sales campaign can be successfully conducted in the spring months, the British Columbia Electric Railway Company, during April, 1924, sold more than 4,000 units to consumers on its lines. Another remarkable feature about the campaign was that despite the fact that a department store and electrical dealers offered other types of units at a reduced price in competition with the central station company, the sales drive was effective and when the competition was offered sales increased rather than decreased.

A new scale of lighting rates aided some in stimulating the sales of kitchen units.

The campaign began during the last days of March as soon as fixtures, which were of the Miller type, could be obtained and it was definitely announced to close on April 30. The price was $8 cash or $8.50 on terms of 75 cents cash and 75 cents a month, including installation and a 100-watt lamp.

The question of whether to put the matter over until the fall of the year was debated before the campaign, but it was decided that effort put into a short campaign in the spring would be time gained and would make it that much easier to repeat the campaign in the fall. Results amply justified this decision as practically no resistance on account of the season was felt. In fact, independent dealers continued to sell daylight units long after the central station campaign closed on April 30.

A crew of twenty salesmen was recruited before the campaign and trained by E. E. Walker, sales engineer of the British Columbia Electric Railway Company. Some time was required for these men to get their bearings and before the less able salesmen could be weeded out. In a few days the crew was averaging total sales of 200 units while in the last few days sales increased to nearly 400 a day.

Advertising took the form of newspaper copy, car cards, posters and a broadside mailed to 20,000 customers. There was an instant response to the newspaper advertising, the first day bringing in seventy telephone orders.

The company used this type of advertisement to combat price competition

Previously to the opening of the campaign, "teaser" advertisements were run using the phrase "Daylight your kitchen," which was new to the territory. Approximately $1,800 was spent in advertising the campaign.

About the second week of the campaign a department store began to advertise daylight kitchen units at $5 but assuring purchasers that "any handy man can install them," this, of course, being contrary to civic regulations. The cost of installation being $1.50 and the cost of a 100-watt lamp being 75 cents, the real price of the competing unit was $7.25 as against $8 for the central station's unit. This department store made use of cuts and slogans similar to those of the central station.

Distinctive advertisements giving details of the purchase plan were used.

The immediate result of this was that many persons at first glance thought the central station unit was too high priced, but advertising was used immediately to explain the unit itself, pointing out the superior features and the small difference in price. Salesmen were instructed along the same lines, and as proof that price competition does not necessarily win, sales increased rather than decreased.

After the central station campaign closed, an electrical dealer in Vancouver advertised a fixture made by himself at $5, including a 100-watt lamp but not installed. A second dealer advertised a still cheaper fixture at $3.50.

This competition had a slight effect in increasing the cancellations under the 15-day free trial offer, but altogether not more than 10 per cent of the 4,200 orders received were canceled.

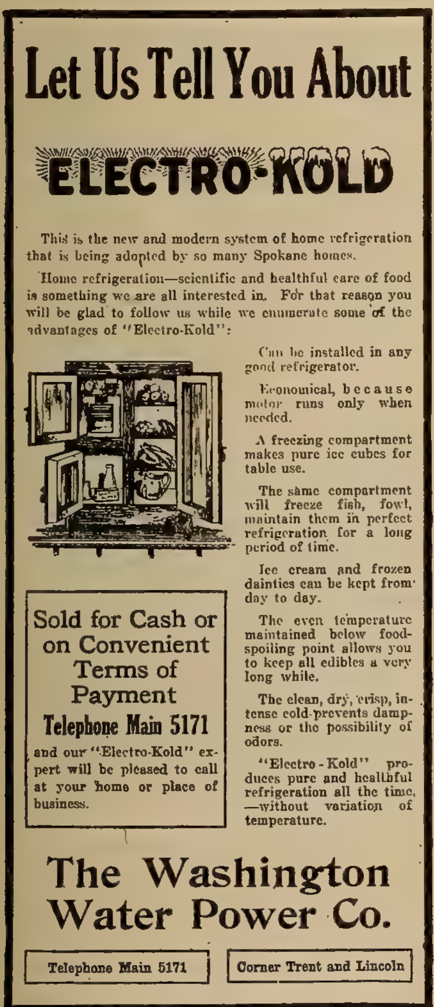
A factor in the success of the campaign was the announcement, previously made by the central station company, of the introduction on May 1 of a two-step rate for domestic consumers at 5 cents per kw-hr., dropping to a 2-cent rate for all current over 3 kw-hr. per 100 sq. ft.

Introducing Electric Refrigeration in Spokane

Washington Water Power Company Places Twenty Refrigerators in Representative Homes for Six Months Free Trial

Feeling that the next step in the complete electrification of the home is the general acceptance of electrical refrigeration, The Washington Water Power Company, Spokane, Wash., has undertaken a campaign to introduce the electrical substitute for the ice man in its Spokane district.

The load is an attractive one from the central station standpoint. The capacity of the individual units is small and



The advertising campaign was largely of an educational character.

requires no extra investment on the power company's part for service. At the same time, it is practically a 24-hr. load, so that the total monthly consumption of the individual household is materially increased. An appliance which adds from $30 to $40 yearly to the revenue from domestic consumers, without additional expense in rendering the service is well worth adding to the lines.

The electric refrigerator on the other hand is a device which is little known to the public and in consequence there is not much natural demand for it at the present time. The Washington Water Power Company started in therefore with almost a fresh field for cultivation.

Naturally, the first question to be decided was the choice of equipment. Because it was felt that the public felt a certain amount of mistrust in refrigerator equipment, fearing that it was too complicated for a layman to handle and therefore liable to get out of order, necessitating delays and expense in repairs, locally manufactured equipment was chosen. The device was very simple in design, of the type which can be installed within the ordinary refrigerator, with few elements which could possibly cause trouble and had the advantage of having the factory near at hand, so that there need be no delay in case replacement of parts or major repairs for any reason became necessary.

The first thing necessary in the campaign was the creation of public interest. Newspaper advertising was of course the first method used. The campaign was not being pushed at this time, so that no concentrated broadside of advertising was focussed on this one subject, but occasional advertisements covering the virtues of electric refrigeration were run, and electric refrigerators were kept in display in the company's store. Some few refrigerators were sold on this basis.

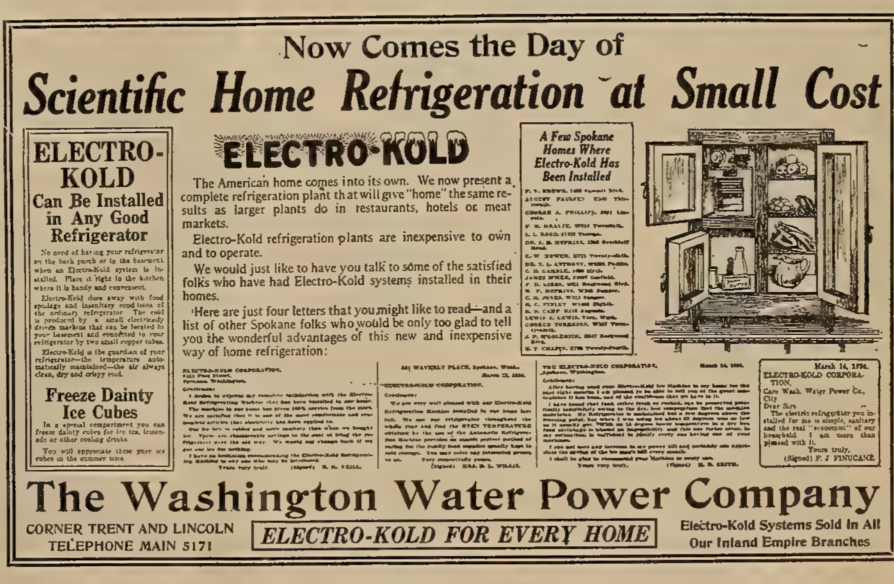
Recognizing that nothing sells electrical equipment as will the equipment itself already in use and that the satisfied customer is the best salesman, the company introduced the refrigerator into twenty selected Spokane homes. Representative men from all professions—doctors, lawyers, manufacturers, of the type whose homes might reasonably support the convenience of electric refrigeration, were selected and were approached with an offer to install the complete equipment in their homes free of charge. They were to have free use of it for a six months period. If, at the end of that time, they felt that electric refrigeration was indispensable to their comfort, they might then enter into a contract with the company for the purchase of the machine, on a time payment basis if desired. If the homeowner was not entirely satisfied, the refrigerating machine would be removed without cost.

The offer was a generous one and, coming, as it did, from a company of high standing, could not well be refused by the citizens approached. No difficulty was found in placing the twenty machines to the best advantage. The company enjoyed the additional revenue from these machines during the period they were in use, so that the experiment in itself was not without returns. The customer, on the other hand, did not have ice bills to pay during this period, so that the cost to him was slight if anything.

The major result, however, was the fact that the refrigerator immediately became a point of general interest in the home. Guests were taken out to see the new equipment and its performance was discussed in the home and outside of it. The complete story of electric refrigeration was told each housewife in whose home the equipment was installed—and she invariably pointed out these conveniences to those to whom she showed her new labor-saver.

One feature which was recommended wherever possible was to install the refrigerator at a height of about 18 in. from the floor. It was no longer necessary to keep the machine low on account of having to lift the ice, it was explained to the housewife, which made this convenience possible. The advantage of being able to sweep with comfort under the ice box, as well as see into the food box without stooping over needs no second explanation to the average woman.

The campaign up to the present time has been merely preliminary. A number of machines have been sold and others are still in use in Spokane homes and will probably represent later sales. Sufficient interest has been aroused so that inquiries are coming in of their own accord concerning refrigeration equipment. The company plans to follow this up with a later campaign pressing home the advantage thus won. Spokane now ranks highest of any city in the United States in the per capita use of electric ranges. The electric refrigerator may soon be added to the record.



Letters from well-known citizens using the refrigerator machines were used in the newspaper advertisements.

Fit the Store Layout to the Individual Business

Character of the Business Conducted Will Be the Determinant in Arranging Store Space to Best Advantage

By JOHN T. BARTLETT

Try to find in your state two electrical store-office-shop layouts approximately alike. You will find this order a difficult one to fill. Not so much because different varieties of retail locations are used, but because premises of approximately the same outside dimensions are so divergently arranged.

One does not fully realize the many possibilities in electrical store layouts until he has mentally or actually before him a dozen or more of them. Like the great variety of combinations possible in a modern lock, so, in adapting premises to a particular business, the dealer and contractor has choice of many different arrangements.

The thing of greatest importance is to make the layout most productive for the individual business done. Heeding this point, electrical dealers and contractors inevitably develop individual store layouts. Probably no other trade that leases retail premises is surrounded with conditions which create greater variation in efficient quarters.

Merchandising is the big thing with one firm, contracting the big thing with another. With a third, equal importance is given to both. One firm puts maximum attention on merchandising of appliances, washers and cleaners. Another features radio, and appliances are in the background. Still another man goes heavily after the fixture trade. Some firms make most of their money in contracting, and the important question is whether the jobs are large or small.

This only suggests the numerous factors, and the combinations of them, in the electrical trade that may influence layouts. When you walk into what seems to be a peculiarly arranged store, investigation will almost invariably reveal that the proprietor does an unusual sort of business. In conducting that business most successfully he has developed an unusual layout.

There are unusual things, to give an illustration, about the corner premises of Clark Rider of the Denver Electrical Company, Denver, Colo. If Mr. Rider has a glass display case and counter, it was not visible on the occasion of the writer's recent visit to his store. The room that is entered from the street is an office room, roughly 11x12 ft. There are two wide entrances from it to the adjoining rooms. There are two desks at the back of the office room, and a table is placed on one side of the room.

Before going further with description it should be explained that the Denver Electrical Company does a large business in fixtures. The electric sign over the store indicates that the firm is strongly interested in this department. There are fixtures in the ceilings of the display windows and others hanging from the ceiling of the office room. In other words, this is a firm specializing in electrical fixtures. If the store windows display appliances, it is a safe surmise that a high percentage of the stock carried is in the window. If something asked for is not in stock, it can be secured quickly from the jobber. The internal arrangement is based on fixture trade.

Mr. Rider uses two large rooms for the display of fixtures, each opening out of the office room. The room through the rear doorway is the "high class" room. The room through the side entrance is an exhibition principally for the buyer interested in lower prices. Both rooms are principally illuminated by artificial light. The "high class" room has no windows in the street side wall. The second display room also has no windows, the back of the display window being made solid except for a small doorway for decorating use.

This fixture dealer believes in putting before the inquirer a great variety from which to pick. There are several scores of fixtures suspended from the ceiling, while around the rooms are many wall fixtures.

Each fixture room is approximately 14x27 ft. The "high class" room has a large mirror in the side wall and an entrance at the rear of the basement. It has a 5½-ft. entrance to the second fixture room. A cabinet 3 ft. by 16 in. by 15 ft. along the side wall of the second fixture room is used for lamps.

In the rear of the moderate-priced fixture room is a room, 9x14 ft., used for stock. This room is large enough, as most of the Denver Electrical Company's stock is stored elsewhere. The shop, one of the smallest electrical shops in Denver, is 9x18 ft. and is behind the stock room.

Down the street half a block from the Denver Electrical Company is a much different layout, that of J. Fischer. This firm has no shop on the premises. The rear, given over to a shop in many electrical firms, is here occupied by a well arranged office, with flat and standing desks. The girl at one of the desks, having a view through to the store premises, is able to attend to routine duties while being ready to meet any customer that may call.

This is a small layout, and not over 700 sq.ft. are used. The width of the room is about 15 ft., and the room occupied by display cases and counters is roughly 24 ft. deep. Cabinets for the display of merchandise are on the left side as one enters, and two display cases are in line down the other side. At the front, occupying space between the display window and cases, is a settee for the comfort of visitors. The right side of the store and the back have wall cabinets and shelves. The office room at the rear is daylight-illuminated from the rear.

As readers have deduced, this is the layout of a firm with which contracting is the big interest, merchandising a minor phase. A small middle-of-the-block location is leased, and in this a third or more of the space is used for office purposes.

Down the street several blocks is Williams & Rose. This is an electrical store which went heavily into radio when radio first swept the country and when department stores, hardware stores and music stores proceeded to stock radio sets and parts. The reaction in Denver cleared the situation, with many dealers sacrificing what stock they had and dropping the line. Williams & Rose is one of the few Denver electrical stores which continued to stock radio. It is known among radio fans as a real radio store.

This special side of its business is apparent in window displays, which always contain much radio merchandise, and in the interior arrangement. The main room is roughly 18x40 ft. The street entrance is on the left side of the front. Display cases extend down the right side nearly to the rear, room being left at the end for a wrapping corner. A desk at the end sets out into the room, facing the front. In the right hand corner at the rear is a small private office.

For the first 18 ft. or so, show cases are filled with radio goods, with the same on the corresponding wall shelves. As the customer enters the store, he is quite likely to see directly ahead of him one of the expensive radio receiving sets in an elaborate cabinet. Down the left side is a cabinet of shelves, 3 ft. or so high, the front covered with green curtain material. Higher on the wall are wall fixtures, while other fixtures hang from the ceiling. The position of the desk at the rear enables the one employee to wait on trade and also attend to the routine office work.

Cahn-Foster is a Denver firm which for years has been heavily interested in merchandise. Several years ago the concern moved into a building bought and remodeled for its special purposes. This store has two windows, one on either side of the entrance. As the customer enters, there are show cases on either side of the room. Space in the center is used partly for the displaying of large appliances. Generous floor space is given to both the motor department, which is in the rear, and the shop located on the second floor.

The smallest store of an electrical nature visited by the writer was that of the Bergman-Dilley Radio Company in Denver. A retail coal office had more room than it wanted, so cut off a portion of the rear of the store room and made it into a store premise. This space is approximately 11 ft. square. The entrance has windows of unequal width on either side. Display cases are down the right side, with shelf and table space opposite. The desk is at the rear in the center.

All of the foregoing leads up to the general observation that the business of an elecarical contractor or dealer is properly the determinant of the plan of arrangement of the premises he leases. The variation in individual business enterprises is such that seldom will any two be just alike, if this principle is heeded.

In the general district of the electrical stores mentioned are a number of other electrical firms. At the present time Denver's electrical trade is well centered, in a section fairly convenient as regards the general public and where prevailing rentals are in a workable relation to the business done by this trade. Denver electrical contractors and dealers quite generally appreciate the fact that this grouping is a benefit to individual dealers.

Sacramento Owner Fully Electrifies Apartments

New Building and Home Remodeled into Apartments Are Fitted with Electric Equipment Throughout

One of the newest and most complete all-electric apartment houses to be opened in Sacramento, Calif., is the Leonard Apartments at 1019 H Street. The apartment house was built by the Albert Realty Company, headed by Harry Leonard. The structure was designed by Miss Irene Leonard, and represents the result of years of study and hard work. There are six three-room apartments and six four-room apartments. Many features regarded by a woman as essential to a complete small

The kitchens in the Leonard Apartments have been designed to eliminate all unnecessary labor.

home have been embodied in these apartments. They are models of modern convenience and practically every conceivable want of the tenant has been taken into consideration.

Before making these apartments completely electrical, the subject was gone into very carefully, and it was found that all the comforts, conveniences and cleanliness are to be had through electrical equipment with hardly any difference in the cost to the tenant. These apartments are equipped with Standard electric ranges and Wesix flush-type electric air heaters. Continuous automatic hot-water service is provided by a central Wesix automatic water heater and a 200-gal. storage tank. These were sold by F. W. Davies of the Great Western Power Company of Sacramento.

The kitchens are provided with plumbing connections and a convenience outlet in the proper location so that an electric refrigerator may be installed without any inconvenience.

The lighting was given special consideration, and the effect is most pleasing, the living room being provided with a five-light wrought-iron drop fixture, two candles and two brackets and a convenience outlet for attaching a floor lamp. The fixtures were made especially for the building by Clifford Prudhomme. The wiring was installed by Latourette-Fical Company. A duplicate building of like nature is planned for the future on the adjoining property.

The old Leonard home situated at the rear of the property was remodeled and made into completely electrical apartments, being equipped the same as the new apartments, except portable air heaters were used instead of the flush type. Service of a sufficient size to provide for the additional building was run to the main switchboard situated in the old home. The total load is on a master meter, and each apartment is sub-metered. A laundry is provided in the basement of the remodeled home. Miss Leonard has been highly complimented for her foresight and faith in making these apartments completely electrical.

The Leonard Apartments at the left and the old Leonard home, which has been remodeled into apartments, are completely electrified.

KNOW WHAT, WHY AND WHEN AND COLLECT THE YEN

By Joe Osier

Before John D. amassed a million he learned the lessons of work, thrift and proper investing; before the Wright Brothers learned to fly, they learned why they fell; before Jack Dempsey became world's champion, he fell heir to divers and sundry beatings and—

Before I finish this column I shall have organized and co-ordinated a set of head muscles which have been trained, after a fashion, to assist me in presenting an idea, to wit:

Before any man in any business succeeds and wins a wad, he must know his dance and strut it according to rote and rule. Failing in these particulars, he is sure, sooner or later, to be numbered among those of that unhappy group which merely gets by and which trembles as the first of the month approaches.

And when I say "strut his dance," I do not mean to be flippant or fresh. I mean this: He must know his business —his employees, his goods, his costs, his customers;

He must know what, when, how, where and why and he must be sure he knows or—

He will probably find the wreck of his undertaking about his ears and will be engaged in paying off first, second and third mortgages as long as there is a breath of life in his tired old carcass.

I know an electrical firm that dropped a fortune just recently because the heads of the concern did not know their costs and lacked the proper appreciation of the conditions pertinent to the contract and—

The man in the limelight watches his step.

They were stuck the minute they filed their bond.

And so, knowing the history of this particular case, I think, were I bidding on any job or contract, big or little, I would hasten slowly and know where I was going before I started.

There is too much by guess and by gosh bidding in these days of getting "back to normalcy," which undoubtedly explains why—

Bond houses are finishing jobs, sheriffs are working overtime and banks are returning checks marked N. S. F.—but—

Despite failures and foreclosure sales, it must be conceded that a business will thrive provided the man at the head of it holds up his head, keeps his eyes open and sails according to the lights set by those who have succeeded.

Yea, verily, the smart shall succeed and the dumb shall be smothered in the onions of ignorance.

NEWS OF THE INDUSTRY

Permits for 125,000-hp. Project in California Issued

The Federal Power Commission has authorized the issuance of a preliminary permit to W. H. Samson of Corning, Calif., covering a comprehensive water power and irrigation development in the Trinity River and tributaries and in the Sacramento Valley in Trinity and Shasta Counties. The proposed development involves the construction on Stuart's Fork of four storage reservoirs, having a total capacity of 20,000 acre-ft. Four power houses with an aggregate capacity of 20,000 hp. are to be constructed. It is proposed to construct a dam across the Trinity one mile below Stuart's Fork, which will create an additional reservoir of 600,000 acre-ft. capacity. Power house No. 5 is to be erected at this dam with an installed capacity of 16,700 hp.

The plan is to divert the water from the tail race of this power house through the Trinity-Sacramento Divide to power house No. 6, on Clear Creek, which is to have an installed capacity of 40,000 hp. A storage dam is to be erected in Clear Creek and the water taken from there to power house No. 7, where it is proposed to install 55,000 hp. Power house No. 7 is to be located on the Sacramento River three miles west of Redding. The water from that tail race will flow into the Sacramento and be used for irrigation at points below. The primary power which will thus become available will aggregate 125,000 hp. The commission inserted in the permit a condition that a flow of at least 20 sec.-ft. must be maintained in the Trinity River below the point of diversion.

Lewis River Company Is Denied Permit for Power Site

Officials of the Washington State Hydraulics Department have notified the Lewis River Hydro-Electric Company of Vancouver, Wash., that the company's application for a water right on the Lewis River in Skamania, Clarke and Cowlitz Counties, filed in June, 1921, has been denied. The denial also cancels the temporary permit held by the company, officials stated.

The action was taken because the company had not complied with statutory requirements in regard to development, it was pointed out. The Northwestern Electric Company of Portland is now doing preliminary work toward the construction of a plant on the North Fork of the Lewis River that will utilize the water in question.

According to the application filed some time ago by the Portland concern, a plant costing approximately $4,000,000 and having an estimated capacity of 60,000 hp. is to be constructed at a point near Yale in Cowlitz County.

Second Tie-In Proposed Between Washington Companies

A second connection between the systems of The Washington Water Power Company, Spokane, Wash., and the Pacific Power & Light Company, Portland, Ore., in central Washington, is contemplated in the 110,000-volt transmission line projected by the latter company between Hanford and Taunton. This line, which will be six miles long, has been surveyed, and the right of way for it has been acquired. It is expected that construction will start soon and that the line will be completed in the early spring. The conductors will be supported on two-pole wooden structures of H-type design.

In connection with this tie-in, a bank of three 3,000-kw., 110,000/66,000-volt, single-phase, General Electric Company transformers will be installed at Hanford, duplicating the present installation at Lind, Wash., which has heretofore been the single connecting point between the systems of the two companies supplying energy to the Pacific Power & Light Company's Yakima-Walla Walla power system at Pasco, Wash. The addition of this second connection will improve service conditions on that system and make it possible to take on additional load.

Proceedings of 1924 P.C.E.A. Convention Published

Bound copies of the Proceedings of the eighth annual convention of the Pacific Coast Electrical Association held at Coronado, Calif., June 17-20, 1924, have been prepared and will be distributed to the membership of the association after Jan. 15. The volume is bound in paper, and one copy will be sent to each member of the association in good standing.

One hundred cloth-bound copies of the Proceedings, suitable for use in permanent libraries, have been prepared and may be secured from S. H. Taylor, secretary of the Pacific Coast Electrical Association, 527 Rialto Building, San Francisco, for $1 each. As the supply is limited, requests for the cloth-bound copies will be filled in the order of their receipt.

The volume includes 256 pages devoted to papers and discussion presented at the convention and a 7-page memorial section dedicated to the late John A. Britton.

Preliminary Permits Extended.—An extension of one year has been authorized recently by the Federal Power Commission for the following preliminary permits: Crocker and Preston, Mokelumne River, California; The California Oregon Power Company, Klamath River, Oregon, and Ralph Bennett, Big Rock Creek, California.

Utility District Seeks Price of Great Western System

At a recent meeting of the directors of the Sacramento Municipal Utility District in Sacramento, Calif., action was taken toward securing from the Great Western Power Company a purchase price on its distributing system in that city. Previous action taken by the board in asking the purchase price of the systems of both the Great Western Power Company and the Pacific Gas and Electric Company was rescinded because the directors wished to avoid any controversy that might arise due to the recent decision of the supreme court in establishing the right of the California Railroad Commission to place a valuation on a public utility sought in purchase by a municipality.

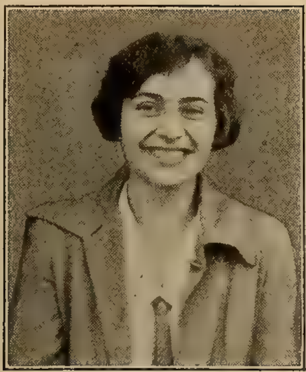
The system is wanted for the distribution of future power planned to be developed upon the completion of the Silver Creek project, and the directors decided not to consider the purchase of the Pacific Gas and Electric Company's system because that would entail the necessity of buying also the system of gas manufacture and distribution and the street car lines of that company.

It was decided that a consulting engineer should be employed to advise the board on all electrical matters connected with the power end of the Silver Creek project and to take charge of the valuation of the Great Western system in case the city decided to buy it. The name of H. G. Butler, formerly with the California Railroad Commission and recently power supervisor in the southern part of the state during the power shortage, was suggested, and a committee was appointed to confer with him and report to the board.

Substitute for Bone Power Bill Being Prepared

A substitute for the Bone free power bill, which was defeated in the state of Washington at the last election, is being prepared for presentation at the coming session of the legislature, according to recent press dispatches. The proposed bill, which is sponsored by B. F. Jacobs, representative from Pierce County, authorizes cities to sell power outside their borders, with a 5 per cent tax on the gross proceeds of such sales. It effects a compromise between the Bone bill, which allowed tax-free sales, and the Reed bill, which would have imposed a 5 per cent tax on sales both within and without city boundaries, if any power were sold outside.

Salt Lake League Takes Larger Quarters.—The Rocky Mountain Electrical Cooperative League, Salt Lake City, Utah, has removed its offices to Rooms 215-216 Kearns Building in that city.



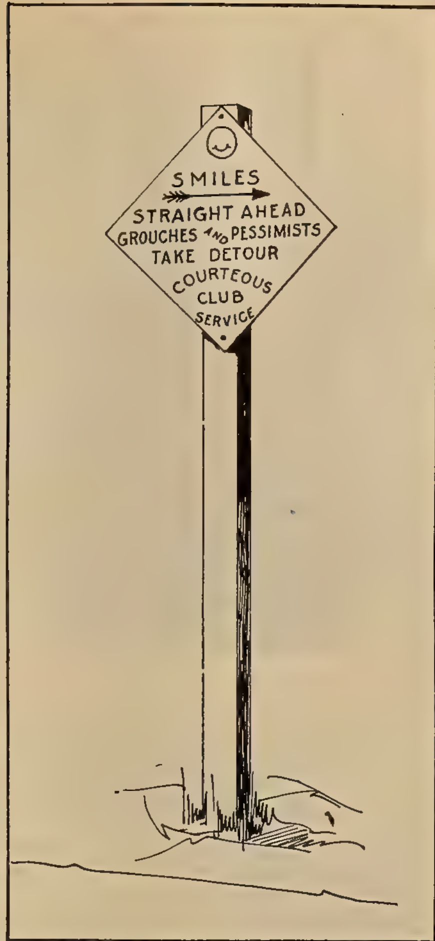
FRANCES PRATT

Winners in Smiles Contests Are Announced by Committee

Miss Frances Pratt of the consumers' department of the San Joaquin Light & Power Corporation, Fresno, Calif., has been adjudged winner in the slogan contest conducted by the Courteous Service Club Committee of the Pacific Coast Electrical Association. The winning slogan submitted by Miss Pratt in the Smiles Contest is "Faith moves mountains but smiles move men." For this slogan Miss Pratt received $10.

The first prize for the best story illustrative of courtesy on the part of an electric service company employee was awarded to W. G. Harold, light and power sales department of the British Columbia Electric Railway Company, Ltd., Vancouver, B. C. The prize-winning story, for which Mr. Harold also received $10, follows:

"An elderly gentleman boarded a British Columbia electric car, with the intention of going to the postoffice to mail an important document, which he had already put into an envelope and addressed. On reaching the postoffice he got off the car only to find that the envelope was not in his pocket. Not knowing that he had lost the letter in the street car, and thinking he had lost it before he boarded the car and it had been picked up by some one, he went home thinking it was lost forever. Late the next day, to explain why it had not been mailed, he went to the office at which the envelope and document should have arrived if it had been mailed. He was greatly surprised to find that the document had already been mailed and had reached the office the day after it had been lost. On his way home he boarded the same car in which he had lost the document the day before and learned that the conductor had found the envelope, sealed it, put the necessary amount of stamps on it and mailed it."



Slogan submitted by J. P. Smith, Southern California Edison Company, Long Beach, Calif.

A special award of $10 was made to J. P. Smith, Southern California Edison Company, Long Beach, Calif., for the slogan which he submitted in the form of a road sign similar to those used by the California State Automobile Association and the Auto Club of Southern California. A sketch of the sign accompanies this article.

Second prize in the slogan contest went to H. A. Walker, Pacific Gas and Electric Company, Stockton, Calif. Mr. Walker's slogan was "Smiles go where grouches fear to tread." Third to sixth prizes, inclusive, went to the following:

Victor Baloun, Station E, Pacific Gas and Electric Company, San Francisco, Calif. "Pave the way with smiles."

C. W. Hughett, consumers department, San Joaquin Light & Power Corporation, Fresno, Calif. "Smile and serve."

C. W. HUGHETT

E. C. Van Buren, credit department, San Joaquin Light & Power Corporation, Fresno. "If backed with a smile, it's service worth while."

P. B. Garrett, general engineer, Westinghouse Electric & Manufacturing Company, San Francisco. "Smile and lead—frown and get left."

E. C. VAN BUREN

Second prize in the story contest was awarded to John W. Otterson, Journal of Electricity, San Francisco. Third to sixth prizes were awarded to the following:

F. A. Easton, San Joaquin Light & Power Corporation, Fresno.

F. G. Morales, construction department, Southern California Edison Company, Los Angeles, Calif.

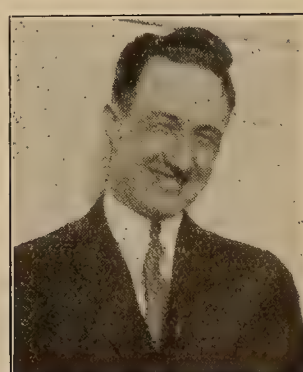
Mrs. Ruth M. Williams, Southern California Edison Company, Los Angeles.

A. R. Eggers, Pacific Gas and Electric Company, San Francisco.

Approximately two hundred stories and slogans were submitted in the contest.

H. A. WALKER

VICTOR BALOUN



P. B. GARRETT

Committee Chairmen Named for 1925 N.E.L.A. Convention

Plans for the 1925 convention of the National Electric Light Association to be held in San Francisco during the week of June 15 have taken definite shape with the announcement of committee personnel by Frank A. Leach, Jr., president of the Pacific Coast Electrical Association.

Franklin T. Griffith, president of the National Electric Light Association and president of the Portland Electric Power Company, will be honorary chairman of the general convention committee. Wigginton E. Creed, president of the Pacific Gas and Electric Company, will act as chairman. There will be three vice-chairmen: James B. Black, vice-president and general manager of the Great Western Power Company; J. B. Miller, president of the Southern California Edison Company, and Samuel Kahn, vice-president and general manager of the Western States Gas & Electric Company. C. T. Hutchinson of McGraw-Hill Company of California will act as secretary of this body. The following will constitute the membership of the committee: R. M. Alvord, General Electric Company, San Francisco;

FRANKLIN T. GRIFFITH

P. S. Arkwright, Georgia Railway & Power Company, vice-president of the National Electric Light Association; M. H. Aylesworth, managing director, National Electric Light Association; R. H. Ballard, vice-president and general manager, Southern California Edison Company; William Baurhyte, president, Los Angeles Gas & Electric Corporation; T. E. Bibbins, president, Pacific States Electric Company; Henry Bostwick, San Francisco district manager, Pacific Gas and Electric Company; R. M. Boykin, manager, central district, Puget Sound Power & Light Company; George Campbell, manager, Truckee River Power Company; J. E. Cranston, Pacific Coast manager, General Electric Company; J. E. Davidson, Nebraska Power Company, vice-president, National Electric Light Association; P. M. Downing, vice-president, Pacific Gas and Electric Company; R. E. Fisher, vice-president, Pacific Gas and Electric Company; J. D. Grant, chairman of board, The California Oregon Power Company; C. E. Heise, San Francisco manager, Westinghouse Electric & Manufacturing Company; D. L. Huntington, president, The Washington Water Power Company; Frank A. Leach, Jr., vice-president and general manager, Pacific Gas and Electric Company; A. W. Leonard, president, Puget Sound Power & Light Company; L. T. Merwin, vice-president and general manager, Northwestern Electric Company; F. S. Myrtle, Pacific Gas and Electric Company; R. F. Pack, Northern States Power Company, vice-president, National Electric Light Association; J. F. Pollard, vice-president and general manager, Coast Valleys Gas & Electric Company; H. T. Sands, Chas.

WIGGINTON E. CREED.

H. Tenney & Company, vice-president, National Electric Light Association; M. W. Scanlon, Westinghouse Electric & Manufacturing Company; E. O. Shreve, San Francisco manager, General Electric Company; Guy M. Talbot, president, Pacific Power & Light Company; Samuel H. Taylor, secretary, Pacific Coast Electrical Association; W. G. Vincent, Jr., vice-president, Pacific Gas and Electric Company; A. B. West, president, The Southern Sierras Power Company; W. H. Whiteside, vice-president, Westinghouse Electric & Manufacturing Company; A. E. Wishon, general manager, San Joaquin Light & Power Corporation.

Officials of the executive committee will be: Frank A. Leach, Jr., vice-president and general manager, Pacific

FRANK A. LEACH, JR.

Gas and Electric Company, chairman; Wm. Baurhyte, president, Los Angeles Gas & Electric Corporation, vice-chairman; Samuel H. Taylor, secretary, Pacific Coast Electrical Association, secretary.

Other committee chairmen appointed are:

Budget—E. O. Shreve, General Electric Company, chairman; K. E. Van Kuran, Westinghouse Electric & Manufacturing Company, vice-chairman.

Construction and Equipment—P. M. Downing, chairman, and A. U. Brandt, vice-chairman, both of the Pacific Gas and Electric Company.

Entertainment—R. E. Fisher, Pacific Gas and Electric Company, chairman; D. E. Harris, Pacific States Electric Company, vice-chairman.

Hotels—C. E. Heise, Westinghouse Electric & Manufacturing Company, chairman; A. H. Nicoll, Western Electric Company, vice-chairman.

Personnel and Supplies—Henry Bostwick, Pacific Gas & Electric Company, chairman; R. A. Balzari, Westinghouse Electric & Manufacturing Company, vice-chairman.

General Transportation—R. M. Alvord, General Electrical Company, chairman.

Local Transportation—W. G. Vincent, Jr., Pacific Gas & Electric Company, chairman; F. H. Woodward, Great Western Power Company, vice-chairman.

Advertising—M. W. Scanlon, Westinghouse Electric & Manufacturing Company, chairman; J. Charles Jordan, Pacific Gas and Electric Company, vice-chairman.

Publicity—F. S. Myrtle, Pacific Gas and Electric Company, chairman; Al C. Joy, San Joaquin Light & Power Corporation, vice-chairman.

Local Registration—J. F. Pollard, Coast Valleys Gas & Electric Company, chairman; A. G. Jones, General Electric Company, vice-chairman.

General Information—J. B. Black, Great Western Power Company, chairman; A. E. Rowe, Garnett Young & Company, vice-chairman.

General Reception—T. E. Bibbins, Pacific States Electric Company, chairman; Clotilde Grunsky, McGraw-Hill Company, vice-chairman.

Hostesses—Mrs. Franklin T. Griffith, honorary chairman; Mrs. Wigginton E. Creed, chairman.

Subcommittee chairmen and further details of committee personnel will be announced at a later date.

Eastern Oregon Service Will Be Improved During 1925

Seventeen miles of transmission line between Union and La Grande, Ore., will be re-routed, according to the 1925 construction plans of the Eastern Oregon Light & Power Company. This will more than double the carrying capacity of the lines between the generating plants and La Grande.

Fifteen thousand dollars is expected to be expended at the South Baker steam plant to cover the erection of a fireproof building enclosing the turbine room, where a new turbine was installed in 1923, and in improving the equipment for handling the hog fuel used at this plant.

The high-tension switching equipment all over the system will be improved, but there will be little new work done at the four hydro plants. Over $15,000 was spent during 1924 on improvements and extensions to the distribution system, exceeding by more than 50 per cent the work done in 1923.

An increase of 30 per cent in the number of gas customers in Baker, Ore., will necessitate the building of a new gas holder in that city.

Cramp Company to Build Turbines for Cutler Plant.—The Phoenix Utility Company has awarded to the William Cramp & Sons Ship & Engine Building Company a contract for two 21,500-hp. vertical I. P. Morris turbines complete with governors and auxiliaries for the installation in the Cutler plant of the Utah Power & Light Company. These units will be somewhat similar to those now being built by the Cramp company for the Merced Irrigation District of California, where two 24,500-hp. turbines will be installed. The Cramp plant is also completing a contract for three 13,000-hp. vertical Morris turbines, together with governors, intake pipes and penstock valves, which will constitute a part of the extensive superpower development of Japan.

Miss Julia Sutherland Groo, winner of the National Home Lighting Contest, receiving the plans for the $15,000 home from Franklin T. Griffith, president N.E.L.A.

Western Students Win First and Second Prizes

Miss Julia S. Groo and Guadencia Pinaroc Win Electric Home and Scholarship in Home Lighting Contest

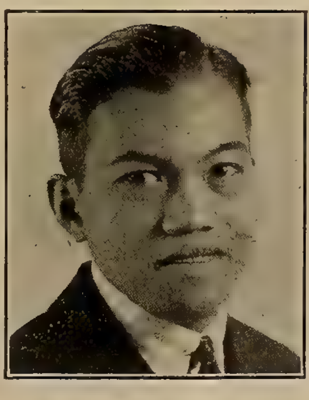
The international grand prize and one of the two second awards in the Better Lighting Contest, conducted by the Lighting Educational Committee of the N.E.L.A., were won by two Pacific Coast high school students. The $15,000 electric home, which was given as the grand prize, was won by Miss Julia Sutherland Groo of Portland, Ore., and Guadencia Pinaroc of Oakland, Calif., was awarded a $1,200 scholarship in any college or university in the United States or Canada. Miss Groo had been the winner of the $200 prize in the Portland district, and Mr. Pinaroc received awards amounting to $550 from his local and regional districts.

Miss Groo, an 18-year-old senior in the Lincoln High School of Portland, has announced that she will build the model electric home in Portland on a site not yet selected. Mr. Pinaroc, a 16-year-old Filipino who has been in the United States only three years, is a freshman in high school and intends to complete his high school education with the aid of the cash secured from his local district, and will use the $1,200 scholarship to assist him in his university career.

Presentation of the certificate for the first prize, and of the plans and specifications of the home, was made to Miss Groo by Franklin T. Griffith, president of the Portland Electric Power Company, and also president of the National Electric Light Association, in a simple ceremony conducted at the Lincoln High School, Jan. 6, 1925. Edgar B. Piper, editor of the Portland Oregonian, and George L. Baker, mayor of the city, took part in the ceremony complimenting the winner. Miss Groo, whose charming personality was felt by all present, responded in a brief speech, modestly accepting the award.

A. C. McMicken, sales manager of the Portland Electric Power Company, and regional director of the Better Home Lighting Contest for the Northwest, and F. H. Murphy, illuminating engineer of the same company, and chairman of the Portland Home Lighting Committee, assisted in the arrangements for the ceremony, at which the committee members and judges in the local contest were present on the stage.

Beside the award of the grand prize, Miss Groo was presented with an order for a $500 garage by the Aladdin Company, to be erected at the site of her new home. She was also offered a position with the Edison Lamp Works of the General Electric Company, at Harrison, N. J., as soon as she should finish her college course which will follow her graduation from high school this year. This position is to be that of lighting expert specializing in home lighting.



GUADENCIA PINAROC

Miss Groo is the daughter of Jay S. Groo, who was for some time sales manager of the Northwestern Electric Company, Portland.

Presentation of the second international prize was made to Mr. Pinaroc at a meeting of the Oakland Electric Club on Jan. 12.

Explosion at Long Beach Plant Kills Four Workmen

Serious accident to a 1,500-hp. steam boiler in the new 100,000-hp. Long Beach steam plant of the Southern California Edison Company, Los Angeles, Calif., due to explosion of accumulation of fuel gas in the furnace, resulted in the loss of four workmen's lives and injury to fifteen.

The boiler was not yet in service but was being warmed up by about one-sixth of the fuel necessary for a full load. For some reason the fires were turned out without proper closing of valves, and an attempt made to relight the fires caused ignition of the explosive mixture. The steam pressure in the boiler at the time was 250 lbs.

With the exception of a few tubes, which will have to be re-rolled, no damage resulted to the boiler proper. The brick work on the boiler setting must be rebuilt, and about half of the windows in the boiler room were blown out or damaged. No damage was sustained by the steel supporting structure of the boiler proper, and practically no damage was done to other boilers in the plant or to the building or apparatus. The damage to the boiler setting and building is estimated at about $20,000. The plant was back in service about five hours after the explosion occurred.

The number of casualties was due to the fact that a large crew of construction men was working in the vicinity of the boiler, and the personal injuries were caused by the force of the explosion and falling material. There was no escaping steam or damage from burns or fire.

Reduction in Prices Announced on All Mazda Brand Lamps

Effective Jan. 1, a reduction was made in the prices of the larger sizes of Mazda lamps. The reduction is of particular interest to users of lamps of 100 to 1,000 watts, on which it amounts to approximately 10 per cent. As the trend of modern commercial lighting has been toward the larger and more efficient type of lamp, factories, industrial shops, stores, office buildings and theaters will be largely benefited by the decreased costs.

The new price lists for Mazda C lamps are as follows:

	Clear	Bowl Enamel	Daylight
100 watt	$ .50	$ .55	$ .80
150 watt	.65	.70	1.05
200 watt	.80	.85	1.30
300 watt	1.25	1.35	1.85
500 watt	2.00	2.15	2.85
750 watt	3.50	3.70	
1,000 watt	3.75	3.95	

This cut in the cost of lamps is attributed to improved machinery and processes which have resulted in greater manufacturing economies.

Long-Bell Electrification Is Described Before Engineers.—At the December meeting of the A.I.E.E., Seattle section, L. D. Beach, electrical engineer, Long-Bell Lumber Company, Longview, Wash., was the principal speaker. He discussed "Electrical Features of the Long-Bell Lumber Company's Development." Mr. Beach had charge of this work for the company's new mill and town development at Longview, Wash.

Pacific Coast Electrical Association

Technical Section Conclave Held at San Francisco

Active Interest in Work at Hand and Projected Evidenced by 145 Men Attending the Various Sessions

Successful and satisfying are the two words best describing the recent conclave of the Technical Section of the Pacific Coast Electrical Association. The Fairmont Hotel was the rendezvous and was entirely satisfactory as such. The meetings were successful in the amount of work upon which progress was reported, the amount of work completed and nearly completed, and in the active interest shown by the 145 men in attendance at the various meetings. Satisfaction was obvious from the remarks of the delegates and visitors.

The meetings were called to order promptly at ten o'clock the morning of Jan. 7 as scheduled and proceeded at once to the work in hand. The discussion was lively and entered into by many different men and became at times just a little bit warm. This demonstrated the interest in and the attention paid to what was going on at the sessions.

Diversion from strictly technical affairs was afforded at two successful social meetings. Thursday evening delegates and visitors gathered in the Red Room and were treated to four interesting and enlightening discussions by as any speakers. S. Waldo Coleman, president of the Coast Counties Gas & Electric Company, spoke on the relation of the technical to the financial side of the business. J. D. McKee, president of the California Oregon Power Company, gave some interesting information about public utility financing and the value of the engineer from the financial viewpoint. S. J. Lisberger advised his listeners that the engineer must be a salesman; that he should have enthusiasm in his work; and that he should train the younger men under him. C. T. Hutchinson, editorial director of the Journal of Electricity, presented some interesting figures comparing the electrical development in the West for 1923 and 1924 and the program for 1925 as announced by the utilities companies.

Friday noon, after most of the work had been completed, everybody gathered again in the Red Room for an informal luncheon and to hear from the Coast's delegates to the St. Louis conclave last October. Also each bureau chairman gave a brief resume of the work of his bureau in order that each person might have a general idea of what was going on even though he had been able to attend only a few of the meetings.

The program of the overhead systems bureau was perhaps the heaviest and lasted the full three days. The first day was given over to reports and discussions of a general nature covering the activities of the committees on distribution transformer standardization, line construction costs, poles, testing high voltage insulators in service, and transmission at 220 kv. Thursday and Friday were used in full by the committee on line construction rules with its various subcommittees.

Not to be outdone by the rules committee, the apparatus bureau added a day to its schedule, finding that more work was at hand than could be completed in one day.

A concentrated half-day session completed the work of the bureau on safety rules while those on prime movers, underground systems, hydraulic power, meters, and inductive co-ordination were busy throughout their full allotment of time.

The accident prevention bureau put in two busy days even though but two of the regular members of the bureau were present and the attendance never exceeded five at any one session. The accident prevention program was thorough, efficient and destined to be of value to the companies actively supporting this phase of the work.

Intensive work is planned by all divisions for the next quarter in order that matters may be brought to a close at the Fresno conclave of the section in March. After that time everybody will be more than busy rounding into final shape and placing in working order the plans and activities for the annual convention of the National Electric Light Association to be held in San Francisco in June. A complete list of those attending the various sessions is as follows:

Abel, J. C.—Western States Gas & Electric Company, Stockton.
Adams, Julian—Pacific Electric Railway Company, Los Angeles.
Affolter, P. H.—Garland-Affolter Engineering Company, San Francisco.
Ager, R. W.—Southern California Edison Company, Los Angeles.
Albert, J. C.—Bureau of Power & Light, Los Angeles.
Andrews, C. A.—Westinghouse Electric & Manufacturing Company, San Francisco.
Baker, W. R.—Pacific Gas and Electric Company, San Francisco.
Bell, H. P.—Key System Transit Company, San Francisco.
Benham, C. F.—Great Western Power Company, San Francisco.
Benson, F. H.—Pacific Gas and Electric Company, San Francisco.
Blecksmith, A. F.—Duncan Electric Manufacturing Company.
Bolser, M. O.—Bureau of Power & Light, Los Angeles.
Bowers, N. A.—Engineering News-Record, San Francisco.

Showing part of the delegates and visitors in attendance at the meetings of the Technical Se

Boyles, R. G.—Southern California Edison Company, Los Angeles.
Brandt, A. U.—Pacific Gas and Electric Company, San Francisco.
Bridges, J. E.—Westinghouse Electric & Manufacturing Company, San Francisco.
Briggs, J. H.—Pacific Gas and Electric Company, San Francisco.
Buehle, E. L.—Pelton Water Wheel Company, San Francisco.
Buell, H. H.—Pacific Gas and Electric Company, San Francisco.
Bullis, S. M.—California Oregon Power Company, Medford, Ore.
Buswell, J. M.—San Joaquin Light & Power Corporation, Fresno.
Capek, T. S.—Pacific Gas and Electric Company, San Francisco.
Cates, R. H.—Southern California Edison Company, Los Angeles.
Champreaux, E. G.—Pacific Telephone & Telegraph Company, San Francisco.
Champion, E. L.—Municipal Lighting Department, Pasadena.
Cobb, R. M.—Pacific Electric Railway Company, Los Angeles.
Coghlan, S. F.—Southern California Edison Company, Los Angeles.
Coleman, S. W.—Coast Counties Gas & Electric Company, Santa Cruz.
Cone, D. I.—Pacific Telephone & Telegraph Company, San Francisco.
Conrad, L. L.—Southern California Edison Company, Alhambra.
Cook, R. E.—Pacific Gas and Electric Company, San Francisco.
Copley, A. W.—Westinghouse Electric & Manufacturing Company, San Francisco.
Corbett, L. J.—Pacific Gas and Electric Company, San Francisco.
Cox, H. H.—Bureau of Power & Light, Los Angeles.
Crellin, A. E.—Pacific Gas and Electric Company, San Francisco.
Crilly, J. E.—Western Electric Company, San Francisco.
Crowell, R.—Pacific Gas and Electric Company, San Francisco.
Cunningham, J. H.—General Electric Company, Los Angeles.
Delany, C. H.—Pacific Gas and Electric Company, San Francisco.
DeWitt, C.—Pacific Gas and Electric Company, San Francisco.
Dreyer, Walter—Pacific Gas and Electric Company, San Francisco.
Duesbury, A. L.—Western States Gas & Electric Company, Stockton.
Ellis, F. T.—Pacific Gas and Electric Company, San Francisco.
Estcourt, V. F.—Pacific Gas and Electric Company, San Francisco.
Eveling, G. H.—Pacific Gas and Electric Company, San Francisco.
Fields, B. W.—Postal Telegraph Cable Company, San Francisco.
Findley, R. B.—General Electric Company, San Francisco.
Fisher, E. C.—Joint Pole Association, San Francisco.
Foster, W. J.—Western Electro-Mechanical Company, Oakland.
Fuller, W. J.—Bureau of Power & Light, Los Angeles.
Garman, E. B.—Bureau of Power & Light, Los Angeles.
Gaylord, J. C.—Southern California Edison Company, Los Angeles.
Gilcrist, C. F.—San Joaquin Light & Power Corporation, Fresno.
Hall, A. J.—Ontario Power Company, Ontario.
Harmon, C. R.—Manufacturer's representative.
Heckman, G. C.—Southern California Edison Company, Big Creek.
Henninger, G. R.—Journal of Electricity, San Francisco.
Heston, W. C.—Electrical World, San Francisco.
Hill, G. S.—Pacific Gas and Electric Company, San Francisco.
Hinson, N. B.—Southern California Edison Company, Los Angeles.
Holst, B. C.—W. N. Matthews Corporation, San Francisco.
Hopkins, R. A.—Westinghouse Electric & Manufacturing Company, Los Angeles.
Hutchinson, C. T.—Journal of Electricity, San Francisco.
Hutchinson, E. C.—Pelton Water Wheel Company, San Francisco.
Ingalls, C. E.—C. E. Ingalls, Inc., San Francisco.
Irwin, Ernest—California Independent Telephone Association, Pomona.
Kasdorff, W. A.—Western Union Telegraph Company, San Francisco.
Keesling, H. G.—Pacific Gas and Electric Company, Oakland.
Kellogg, R. B.—Southern California Edison Company, Los Angeles.
Kellogg, R. B.—Pacific Gas and Electric Company, San Francisco.
Kennelly, D. J.—Southern California Edison Company, Los Angeles.
Kephart, S. W.—Pacific Telephone & Telegraph Company, San Francisco.
Kimball, G. E.—Industrial Accident Commission, San Francisco.
Kirtley, C. J.—Pacific Gas and Electric Company, Oakland.
Klauber, L. M.—San Diego Consolidated Gas & Electric Company, San Diego.
Knopp, O. A.—Pacific Gas and Electric Company, San Francisco.
Lacy, R. W.—Santa Monica Bay Telephone Company, Santa Monica.
Laidlaw, H. A.—Pacific Gas and Electric Company, San Francisco.
Lawton, R. B.—Southern California Edison Company, Big Creek.
Leach, F. A., Jr.—Pacific Gas and Electric Company, San Francisco.
Lutge, H. V.—Pacific Gas and Electric Company, San Francisco.
L'Hommedieu, W. P.—Westinghouse Electric & Manufacturing Company, San Francisco.
Lebenbaum, Paul—Southern Pacific Company, San Francisco.
Lindblad, W. N.—Pacific Gas and Electric Company, San Francisco.
Lisberger, S. J.—Pacific Gas and Electric Company, San Francisco.
Mahon, R. L.—Pelton Water Wheel Company, San Francisco.
May, C. C.—San Diego Consolidated Gas & Electric Company, San Diego.
Mayer, F. H.—Southern California Edison Company, Los Angeles.
McKee, J. D.—California Oregon Power Company, Medford, Ore.
Michener, H.—Southern California Edison Company, Los Angeles.
Minor, H. H.—San Joaquin Light & Power Corporation, Fresno.
Moan, A. J.—The Johns-Pratt Company, San Francisco.
Monges, R. F.—General Electric Company, San Francisco.
Moore, R. D.—Southern Pacific Company.
Morris, J. M.—Westinghouse Electric & Manufacturing Company, Los Angeles.
Myers, A. J.—City of San Francisco, San Francisco.
MacDonald, G. A.—Bureau of Power & Light, Los Angeles.
McCandless, W. A.—Southern California Telephone Company, Los Angeles.
McDonald, J. E.—Joint Pole Committee, Los Angeles.
Neill, H. F.—San Francisco & Sacramento Railroad.
Northmore, E. R.—Los Angeles Gas & Electric Corporation, Los Angeles.
Nott, L. A.—Sangamo Electric Company, San Francisco.
Nott, G. E.—Southern California Telephone Company, Los Angeles.
Ost, P. J.—City of San Francisco, San Francisco.
Owen, F. B.—Pacific Telephone & Telegraph Company.
Owen, L. G.—Pacific Gas and Electric Company, San Mateo.
Peabody, R. M.—Southern California Edison Company, Los Angeles.
Perrin, L. M.—City of San Francisco, San Francisco.
Porter, E. Y.—Southern Sierras Power Company, Riverside.
Powell, R. C.—Pacific Gas and Electric Company, San Francisco.
Pride, A. W.—Westinghouse Electric & Manufacturing Company, Emeryville.
Quick, R. S.—Pelton Water Wheel Company, San Francisco.
Robertson, R. R.—Bureau of Power & Light, Los Angeles.
Robinson, D. M.—Pacific Gas and Electric Company.
Russell, S. P.—H. B. Squires Company, San Francisco.
Schnapp, M. H.—General Electric Company, San Francisco.
Schoch, A. J.—San Diego Consolidated Gas & Electric Company, San Diego.
Schoenberger, E. B.—Pacific Gas and Electric Company, San Jose.
Schnell, C. E.—San Joaquin Light & Power Corporation, Fresno.

ast Electrical Association held Jan. 7, 8 and 9 at the Fairmont Hotel, San Francisco, Calif.

Searle, G. H.—Pacific Gas and Electric Company, San Francisco.
Sharp, H. G.—Pacific Coast Steel Company, San Francisco.
Smith, Vinton—Standard Underground Cable Company, Oakland.
Smith, W. C.—General Electric Company, San Francisco.
Snell, T. W.—Coast Valley Gas & Electric Company, Salinas.
Stanley, H. E.—General Electric Company, San Francisco.
Steele, E. H.—Pacific Gas and Electric Company, San Francisco.
Steinbeck, C. E.—Pacific Gas and Electric Company, San Francisco.
Stewart, C. R.—Southern California Edison Company, Los Angeles.
Stewart, F. E.—Pacific Telephone & Telegraph Company, San Francisco.
Stott, J. H.—Pacific Gas and Electric Company, San Francisco.
Sutcliffe, H. F.—Pacific Gas and Electric Company, San Francisco.
Talbott, W. H.—San Diego Consolidated Gas & Electric Company, San Diego.
Thompson, J. S.—Pacific Electric Manufacturing Company, San Francisco.
Van Bokkelen, W. R.—Coast Counties Gas & Electric Company, Santa Cruz.
Wagner, Charles—Market Street Railway Company, San Francisco.
Walker, C. W.—Ontario Power Company, Ontario.
Waltham, R. O.—California Railroad Commission, San Francisco.
Weymouth, C. H.—Charles C. Moore Company, Engineers, Inc., San Francisco.
Whitney, W. G.—Pacific Gas and Electric Company, San Francisco.
Wiggins, C. W.—San Diego Consolidated Gas & Electric Company, San Diego.
Wilkie, F. H.—Pacific Gas and Electric Company, Oakland.
Wilkins, Roy—Pacific Gas and Electric Company, San Francisco.
Wingard, O. W.—Bureau of Power & Light, Los Angeles.
Winter, W. L.—Westinghouse Electric & Manufacturing Company, San Francisco.
Woodbridge, J. E.—Ford, Bacon & Davis, Inc., San Francisco.
Wright, E. M.—Pacific Gas and Electric Company, San Francisco.
Yeager, L. B.—Los Angeles Railway Corporation, Los Angeles.
Young, C. E.—Pacific Gas and Electric Company, San Francisco.

Commercial Section Executive Committee Meeting Report

The executive committee of the Commercial Section of the Pacific Coast Electrical Association met at the Palace Hotel, San Francisco, Calif., Jan. 9 at 10 a.m. A. M. Frost, manager of sales, San Joaquin Light & Power Corporation, Fresno, Calif., and chairman of the committee, presided, while J. L. Moulton officiated as secretary pro tem. The meeting was largely taken up with reports of the various committee chairmen and with discussions of papers for the annual convention to be held at San Francisco the week of June 15, 1925.

Mr. Moulton as chairman of the electric transportation bureau presented a report for that bureau, and the report of the appliance bureau was presented by the chairman, H. C. Goldrick, specialty sales manager, Western Electric Company, Los Angeles, Calif. H. K. Griffin of the Western States Gas & Electric Company, Stockton, Calif., reported on the customer relations bureau and described briefly an employees' manual that is being drawn up by the bureau. A report of the Lighting Bureau was presented by the chairman, H. M. Crawford, sales manager, Pacific Gas and Electric Company, San Francisco, who told of the various activities of the lighting bureau. V. W. Hartley reported on the Home Lighting Contest and the follow-up that has been made effective by the electrical industry. Clark Baker of National Lamp Works of General Electric Company, Oakland, Calif., described the lighting school that is to be held in Los Angeles, beginning Jan. 19, and in San Francisco, beginning Feb. 2, and gave considerable detail of the course to be presented, as well as the personnel of the faculty. Roy C. Bragg, chairman of the electric cooking and heating bureau, reported for that bureau, and H. E. Sandoval, manager electric sales, Pacific Gas and Electric Company, San Francisco, presented the report of the power bureau. E. G. Stahl of the San Joaquin Light & Power Corporation reported for the subcommittee on electricity in agriculture. Roy C. Bragg, H. C. Goldrick and G. W. Barker were appointed by the executive committee to attend the meeting of the Commercial National Section, to be held at New York City March 17-19.

The next meeting of the executive committee of the Commercial Section will be held at Fresno, Calif., April 3 and 4. This will be a conclave and executive meeting and will be held in the San Joaquin Light & Power Corporation's building.

Purchasing and Stores Section to Meet in February.—The Purchasing and Stores Section of the P.C.E.A. will hold a conclave meeting at the San Joaquin Light & Power Building, Fresno, Calif., Feb. 10 and 11.

Publicity Section to Hold Meeting in Fresno.—A. C. Joy, chairman of the Publicity Section of the P.C.E.A., has called a meeting of that section for Jan. 31. The meeting will be held in the committee room of the San Joaquin Light & Power Building, Fresno, Calif., and will convene at 10 a.m. The section will outline papers to be prepared in advance of the coming P.C.E.A. convention.

G. E. Company Disposes of Stock in Electric Bond & Share

The board of directors of the General Electric Company, at a special meeting in New York City on Dec. 30, 1924, took action whereby the company will dispose of its holdings in the Electric Bond & Share Company. The method by which this will be done is explained in the following statement issued to the stockholders of the General Electric Company under date of Dec. 30 and signed by Owen D. Young, chairman of the board of directors, and Gerard Swope, president of the company:

"The General Electric Company, having decided to dispose of all of its shareholdings in the Electric Bond & Share Company, will do so by organizing a new corporation under the laws of the State of New York with an authorized capital stock of 1,802,870 shares without par value (being the same number of shares as the outstanding common stock of the General Electric Company) and by transferring to such new corporation:

"(a) 300 shares of the 6 per cent cumulative preferred stock of the Electric Bond & Share Company, having a par value of $30,000, and

"(b) 250,000 shares of the common stock of the Electric Bond & Share Company (being the entire common stock), having a par value of $25,000,000, and now paying dividends at the rate of 8 per cent per annum.

"The new corporation, in consideration of such transfer, will distribute its shares to the stockholders of record of the General Electric Company as of Jan. 15, 1925, ratably in proportion to their holdings; that is to say, one share of stock of the new corporation to each General Electric share. This distribution will be made on Feb. 1, 1925, or as soon thereafter as the necessary legal steps can be taken, when certificates for shares of the new corporation will be mailed to all stockholders of the General Electric Company.

Municipal Water System Salaries Not Exempt From Tax

A careful study is being made by Senator Shortridge of California of the ruling made by the Commissioner of Internal Revenue, in which he finds, among other things, that compensation received for services for a municipally-owned water system is not exempt from income tax. Senator Shortridge states that he is not as yet prepared to say that the ruling is in any way unjust, but he believes the status of state and municipal employees in the service of publicly owned utilities should be considered very carefully before this ruling is accepted. The commissioner's finding in this connection was handed down Sept. 1, 1924. It follows:

In deciding whether or not any particular activity in which a state or municipality may be engaged is a governmental function, the attitude of the federal rather than the state authorities should govern.

The compensation received for services rendered in connection with a municipally owned water system is not exempt from income tax.

Advice is requested relative to the application of the principles set forth in Solicitor's Opinion 152 (C.B. II-2, 93), where it was held that the compensation of employees of a street railway owned and operated by a municipality was not exempt from federal income tax under the Revenue Act of 1921, upon the theory that the operation of a street railway is not a governmental function of a city.

In deciding whether or not any particular activity in which a state or municipality may be engaged is a governmental function, the attitude of the federal rather than the state authorities should govern. [See St. Louis Cotton Compress Co. v. Arkansas, 260 U. S. 346; Boston & Maine Railroad v. United States, 265 Fed. 578 (T. D. 3004); Lane Timber Co. v. Hynson, T. D. 3592; Bulletin III-22, 22; Boise Title & Trust Co. v. Evans, 295 Fed. 223 (T. D. 3551; Bulletin III-8, 10).] Where there is a substantial difference of opinion among the state courts and no ruling of any federal court, the decisions of those courts holding a certain activity to be nongovernmental should be followed in every state, regardless of the rulings of individual states to the contrary. The existence of a well-founded or rational doubt as to the character of the activity should be considered as equivalent to the denial of a claim for exemption on behalf of an employee. In general, the rule that exemptions from taxation are to be strictly construed should be applied and no intendment should be taken in favor of the taxpayer in doubtful cases. (See Wright v. Georgia, etc., R. R. Co., 216 U. S. 420.)

In the brief filed on behalf of the employees of the municipally owned waterworks system, decisions of the courts of the state holding that the operation of a waterworks system of a city is an exercise of a governmental function are cited. The United States District Court for the District of Massachusetts on May 21, 1924, however, decided that compensation received for services rendered in connection with a municipally owned water system was not exempt from income tax. (Metcalfe v. Eddy, unreported to date.) This appears to be in harmony with the rulings of the federal courts holding municipal waterworks to be non-governmental in cases other than those involving income taxes (Winona v. Botzet, 169 Fed. 321), as well as with the weight of authority among the states, and should be followed in all cases, irrespective of the attitude of the courts or statutes of the individual states.

Inquiry is also made as to whether or not the ruling set forth in Solicitor's Opinion 152 should be made retroactive under the Revenue Act of 1921. In the opinion of this office that ruling necessarily controls all cases arising under the Act referred to.

Meetings

Essay Contest Is Discussed at Association Meetings

Talks by two high school students, Arthur Wuth and Russell Dondanville, both of Denver, Colo., were the outstanding features of the annual joint midwinter meeting of the Rocky Mountain Division of the National Electric Light Association and the Colorado Public Service Association, held in Denver Dec. 18. The boys, both speakers of unusual ability, were assigned the responsibility of determining, by personal contact, the effect upon students of the recent Better Home Lighting Essay contest. They gave the results of their investigation to the utility men in ten-minute speeches. Both boys have won awards for public speaking, and the capable manner in which they covered their subjects made a deep impression upon the utility representatives.

C. N. Stannard, vice-president and general manager of the Public Service Company of Colorado, regional director of the essay contest activities, and S. W. Bishop, manager of the Electrical Co-operative League of Denver, under whose auspices the Denver contest was held, also reported. In the opinion of these two speakers, the contest was a tremendous success.

J. J. Withrow of the Sheridan Electric Company, Sheridan, Wyo., led the discussion on the essay contest. He conducted the most successful contest recorded in the Rocky Mountain territory. Out of 800 students who enrolled in the contest he was able to obtain return of 735 completed essays.

In the opinion of the delegates to the Denver conference, the contest should be held annually, for the interest that was aroused among adults as well as the school children indicates that the entire utility industry has greatly benefited, especially from the standpoint of public relations.

Approximately 120 electric, gas, street railway and telephone company representatives attended the Denver meeting. One session was presided over by W. P. Southard, president of the Colorado association. C. A. Semrad, president of the Rocky Mountain Division of the N.E.L.A., presided at the other.

RUSSELL DONDANVILLE.

Discussion covered a wide range of subjects, including natural gas; traffic problems as they relate to the public utility industry as a whole; cooperation of the utilities and the institutions of higher education; merchandising; the work of women's public relations committees; rural extension problems and kindred topics.

COMING EVENTS

Electrical Contractors and Dealers' Association of San Francisco—
Annual Banquet—Whitcomb Hotel, San Francisco, Calif.
Jan. 17, 1925

Pacific Division Electrical Supply Jobbers' Association—
Annual Meeting—Del Monte, Calif.
Jan. 29-31, 1925

California Electragists—
Quarterly Meeting—Sacramento, Calif.
Feb. 13-14, 1925

New Mexico Electrical Association —
Annual Convention—Albuquerque, N. M.
Feb. 16-18, 1925

Commercial National Section, N.E.L.A.—
New York, N. Y.
March 17-19, 1925

Southwestern Public Service Association—
Annual Convention—Rice Hotel, Houston, Texas
May 5-8, 1925

Electrical Supply Jobbers' Association—
Annual Convention—Hot Springs, Va.
June 1-6, 1925

National Electric Light Association—
Annual Convention—San Francisco, Calif.
June 15-19, 1925

Pacific Coast Jobbers to Meet at Del Monte.—The annual meeting of the Pacific Division of the Electrical Supply Jobbers' Association will be held at the Hotel Del Monte, Del Monte, Calif., Jan. 29-31. Officers for the coming year will be elected at this meeting, which is the first one to be held in 1925.

Washington Water Power Commercial Department Holds Banquet.—The commercial department of The Washington Water Power Company, Spokane, Wash., held its annual banquet at the Davenport Hotel on the evening of Dec. 30. Lewis A. Lewis, sales manager, presided and complimented the department upon the excellent results shown during 1924 in Spokane, where the sales of merchandise showed an increase over the previous year. Most of the local retailers have reported a decrease in volume for 1924 as compared with 1923. Entertainment was provided by various members of the department.

Construction of Pit 4 Plant to Be Started in 1925.—The Pacific Gas and Electric Company, San Francisco, Calif., has announced that construction work on the Pit 4 generating plant of the company on Pit River in northern California will be started in 1925. This plant, according to early estimates, will have a capacity of 135,000 hp. when completed and will cost in the neighborhood of $15,000,000. It is planned to spend approximately one-sixth of this amount for work to be done during the present year. Details of design and construction have not been announced by the company.

San Diego Club Elects Officers at Annual Meeting

Hugo Kuehmsted and Herb Rose were named as the friendly rivals for the presidency of the Electric Club of San Diego, Calif., by the nominating committee, as reported to the club at its Jan. 6 meeting. The election of officers was held at the annual meeting and banquet Jan. 13 at the Cabrillo Cafe, the former power company office building now turned restaurant.

For first vice-president, Bruno Barth and H. H. Watson were put up for choice, while C. C. Clardy and William Ellison vied for the second vice-presidency. The secretary-treasurership was left to the club for decision between the incumbent, Guy Miller, and Charles Stevens.

As candidates for the executive committee of five the following were named by the nominating committee: William Boyce, W. A. Cyr, G. H. P. Dellmann, Al May, Carl Wiggins, E. R. Damarus, Ralph Zink, Sam Hall, Evan Shaeffer and Walter Rainey.

The nominating committee this year as appointed by G. H. P. Dellmann, retiring president, was composed of Walter Wurfel, chairman; Jess Zwiener, Al May, Bruno Barth and C. L. Lawrie.

COMING PACIFIC COAST ELECTRICAL ASSOCIATION MEETINGS

Publicity Section—
San Joaquin Light & Power Building, Fresno, Calif.
Jan. 31, 1925.

Purchasing and Stores Section—
San Joaquin Light & Power Building, Fresno, Calif.
Feb. 10-11, 1925

Technical Section—
Conclave and Executive Meeting—San Joaquin Light & Power Building, Fresno, Calif.
March 25-27, 1925

Commercial Section—
Conclave and Executive Meeting—San Joaquin Light & Power Building, Fresno, Calif.
April 3-4, 1925

California Electragists to Hold Quarterly Meeting

The California Electragists will hold their regular quarterly meeting at Sacramento, Calif., Feb. 14, 1925. Walter F. Price, executive secretary, has made arrangements with the Southern Pacific Company for the use of the steamer Navajo for those members from the San Francisco Bay territory and others who wish to make the trip to Sacramento by boat. The Navajo will leave San Francisco at 5:30 p.m. Friday, Feb. 13, and will arrive in Sacramento early the following morning. The executive committee meeting will be held at 9 a.m. Saturday, Feb. 14, and there will be an open meeting at 1 o'clock on the same date. The boat party will leave Sacramento on the return trip at 6 p.m., Feb. 14, and will arrive in San Francisco about 9 a. m. the following day.

The round trip fare, including dinner, midnight lunch and breakfast on the boat each way, is $12. Reservations should be made immediately. Tickets may be secured only from Walter F. Price, executive secretary, California Electragists, 318 New Call Building, San Francisco.

Personals

Curtis B. Hawley, vice-president and general manager of the Inter-Mountain Electric Company, Salt Lake City, Utah, was recently elected president of the Rocky Mountain Electrical Cooperative League and chairman of the board of trustees of that organization. Mr. Hawley is one of the most prominent and active men of the electrical industry in the Intermountain section. He was born in Salt Lake City in 1872. In 1888 he finished his high school work and entered the Rio Grande Railroad shops in Salt Lake City as a mechanic. In his spare time he studied electrical engineering, and a short time later he obtained a position as engineer in one of the first lighting plants established in Salt Lake City. After a short time he left to accept the position of master mechanic with the street railway company of that city, remaining there three years. After a short absence from Salt Lake, he returned and entered the electrical contracting business, organizing the Utah Electrical Company, a small corporation with a capital of $5,000. The business grew, and in 1906 Mr. Hawley, together with Lafayette Hanchett, who is now president of the Utah Power & Light Company, and two other associates, bought the Inter-Mountain Electric Company. Under Mr. Hawley's management the business has expanded greatly. In addition to his active participation in league affairs and in matters pertaining to the upbuilding of the electrical industry in his territory, Mr. Hawley gives generously of his time and his ability in furthering the civic interests of his city and the general welfare of the State of Utah. In 1920 and 1921 he served as president of the Salt Lake City Chamber of Commerce, and has been instrumental in the success of a number of community enterprises.

CURTIS B. HAWLEY.

J. W. Bridger, salesman for the Westinghouse Electric & Manufacturing Company, recently returned to his position in Denver, Colo., after a seven months' leave of absence.

D. C. Barnes, formerly manager of the central district, Puget Sound Power & Light Company, Seattle, Wash., and now vice-president of the company with headquarters in Boston, Mass., recently spent two weeks in Seattle. He expects to visit the Coast at least once a year.

Arthur Kempston, formerly with Chas. T. Phillips & Company, consulting engineers of Los Angeles, Calif., has been made assistant manager of the Majestic Electric Appliance Company, San Francisco, Calif.

J. H. Cunningham, General Electric Company, Los Angeles, Calif., recently spent some time in San Francisco while in attendance at the session of the P.C.E.A. Technical Section meeting.

R. G. Boyles, superintendent of distribution, Southern California Edison Company, Los Angeles, Calif., was an attendant at the recent meeting of the P.C.E.A. Technical Section held in San Francisco, Calif., recently.

Frank A. Ketchem, general manager of the merchandising department of the Western Electric Company, New York City, is visiting on the Pacific Coast. Mr. Ketchem will take in all of the Coast offices of the company before returning to his office.

I. U. Muffley, resident manager of the Puget Sound Power & Light Company at Wenatchee, Wash., was chairman of the committee in charge of street decorations in that city during the recent holiday season.

W. F. Hynes, electrical engineer of Portland, Ore., was a recent visitor in San Francisco, Calif.

Murray Bourne, San Joaquin Light & Power Company, Fresno, Calif., recently paid a visit to San Francisco, Calif.

H. L. Rubardt, Los Angeles, Calif., has purchased Quick's Electric Shop, 4505 South Vermont Avenue, that city. Using the same firm name, he will manufacture and stock radio equipment, in addition to retailing electrical equipment and contracting.

William Hoflich, formerly associated with Glenn W. Willard in the Albany Electric Store, Albany, Ore., recently became local agent for Delco farm lighting units, Frigidaire refrigerators and Savage washing machines. He will have headquarters in the Willard Elec-

R. B. Kellogg, superintendent of steam generation for the Southern California Edison Company, Los Angeles, Calif., was an attendant at the Pacific Coast Electrical Association's Technical Section meeting held Jan. 7-9 in San Francisco, Calif.

S. Arnold King, for many years in the service of the Pacific Power & Light Company, Portland, Ore., in various capacities, and more recently lineman and trouble man at Hood River, Ore., has been promoted to be line foreman at Astoria, Ore.

Guy W. Talbot, president, Pacific Power & Light Company, Portland, Ore., recently visited San Francisco, Calif., for the purpose of a business conference. **W. T. Neill**, superintendent of rates and service for the same company, accompanied him.

R. C. W. Libbey, representative of Landers, Frary & Clark, New Britain, Conn., in the Intermountain territory, is attending a sales conference at the factory. While East Mr. Libby expects to visit his old home in Boston, Mass.

C. E. Schnell, electrical designing engineer, San Joaquin Light & Power Corporation, Fresno, Calif., attended the recent meeting of the Technical Section of the Pacific Coast Electrical Association held in San Francisco.

George R. Randall, president and general manager of the Salt Lake Electric Supply Company, Salt Lake City, Utah, was recently elected vice-president of the Rocky Mountain Electrical Cooperative League.

G. C. Heckman, superintendent of electrical construction on the Big Creek project of the Southern California Edison Company, Los Angeles, Calif., attended the meeting of the Technical Section of the Pacific Coast Electrical Association held recently in San Francisco, Calif.

Glenn W. Willard, formerly associated with William Holflich in the Albany Electric Store, Albany, Ore., has purchased the latter's interest. The new establishment will be known as the Willard Electric Store and will engage in a general contractor-dealer business.

R. C. Moeller, general manager of the Providence Insulated Wire Company, Providence, R. I., has just made a trip to Pacific Coast points.

H. L. Melvin, electrical engineer with the Washington Water Power Company, Spokane, Wash., since August, 1922, has resigned to take a position in the engineering department of the Electric Bond & Share Company, New York. In his new position, which he enters upon Jan. 15, he will specialize in power transmission. Mr. Melvin graduated with a B. S. degree from Washington State College, Pullman, in 1911. After graduation he spent a year in the testing department of the General Electric Company, Schenectady, N. Y., and in 1912 returned to Washington State College as instructor in electrical engineering, remaining until 1916. In 1917 he completed a year's study in the Massachusetts Institute of Technology, receiving a master's degree in electrical engineering, and immediately thereafter took a position in the engineering department of the Utah Power & Light Company, Salt Lake City, Utah. He went to the Washington Water Power Company in April, 1920, and was made electrical engineer two years later. Mr. Melvin is past chairman of the Spokane section of the American Institute of Electrical Engineers.

H. L. MELVIN.

Bernhard Badrian, since 1917 district manager of the Hurley Machine Company, with headquarters at San Francisco, Calif., has resigned from the employ of that company to engage in business for himself as a manufacturers' representative. Mr. Badrian has opened offices in the Rialto Building, San Francisco.

Al and J. E. Podesta, under the firm name of Podesta Bros., have opened a fully equipped electrical shop at 88 Main Street, Jackson, Calif. In addition to handling appliances and general electrical merchandise, the concern does repairing and contracting.

William P. Bear, manager of the Pacific Radio Exposition held in the Civic Auditorium, San Francisco, Calif., 1924, has joined the force of the Magnavox Company, Oakland, Calif.

R. Wolfsberg, until recently manager of the Los Angeles, Calif., office of Allied Industries, Inc., has resigned to go into business for himself.

L. D. Beach, electrical engineer, Long-Bell Lumber Company, Longview, Wash., was the principal speaker at the December meeting of the Seattle section of the A.I.E.E.

A. M. Frost, sales manager, San Joaquin Light & Power Corporation, Fresno, Calif., was a recent visitor in San Francisco, Calif. While there he attended the meeting of the Technical Section of the P.C.E.A.

R. A. Sharon, until recently city sales superintendent, Standard Oil Company, Bakersfield, Calif., has been appointed an assistant sales manager for the Great Western Power Company, San Francisco, Calif. A native of San Francisco, Mr. Sharon attended the Oakland High School and Phillips Exeter Academy, Exeter, N. H., and was graduated from Yale University in 1912, having specialized in electrical engineering. He entered the employ of the City Electric Company, San Francisco, where he was an industrial power salesman until 1918, when he enlisted in the army. While in service he received a commission as second lieutenant in the Air Service. Upon being discharged from the army he became associated with the Standard Oil Company at Portland, Ore., as salesman. He was promoted to the position of service station superintendent at Seattle, Wash., for that company and later held a similar position at Sacramento, Calif.

R. A. SHARON

R. A. Hopkins and **John Morris**, of the Los Angeles, Calif., office of the Westinghouse Electric & Manufacturing Company, were recent visitors in San Francisco, Calif. While there they attended the Pacific Coast Electrical Association's Technical Section meeting.

J. C. Alberts, superintendent test department, and **H. H. Cox**, superintendent substations, Bureau of Power and Light, Los Angeles, Calif., recently journeyed to San Francisco to be present at the meeting of the P.C.E.A. Technical Section meeting.

K. I. Dazey, San Francisco, Calif., distributor for the Commercial Truck Company, has just returned after a four weeks' trip throughout the East, including an inspection of the factory of the Commercial Truck Company and investigations of operative conditions in the larger Eastern cities.

J. A. Hale, assistant chief engineer, Utah Power & Light Company, Salt Lake City, Utah, is a member of the committee of the Utah section of the American Society of Civil Engineers that is making preliminary plans for the program for the annual convention of the society to be held in Salt Lake City July 8-11, 1925.

H. H. Courtright, manager, Valley Electrical Supply Company, Fresno, Calif., was recently in San Francisco, Calif., on business.

M. E. Wagner, Western Electric Company, New York City, N. Y., recently paid a visit to San Francisco, Calif.

R. B. Lawton, division superintendent of generation in charge of the Big Creek plants of the Southern California Edison Company, Los Angeles, Calif., was among those who attended the meeting of the Technical Section of the Pacific Coast Electrical Association held in San Francisco, Calif., Jan. 7-9.

Roderick McRae, recently line foreman at Astoria, Ore., for the Pacific Power & Light Company, Portland, Ore., has been promoted to be superintendent at Lewiston, Idaho, in charge of the electrical work in that district newly acquired by the Pacific Power & Light Company.

J. A. Kahn, C. B. Hawley, J. M. Perlewitz and **W. J. Berryman**, representing the jobbers; **Robert Miller, W. A. Moser, B. E. Rowley** and **Thad J. Stevens**, representatives of the manufacturers; **J. V. Buckle, George R. Randall, G. W. Forsberg** and **G. J. Guiver** for the contractor-dealers; **D. C. Green, P. M. Parry, H. M. Ferguson** and **R. M. Bleak**, central station delegates; and **Orson John Hyde**, representative of the telephone company, constitute the membership of the recently elected board of trustees of the Rocky Mountain Electrical Cooperative League.

Harold V. Bozell, for the past two and a half years one of the two editors of the Electrical World, has resigned from that position to join the firm of Bonbright & Company, bond brokers, New York City.

C. E. Hardy, chief of the department of electricity, Oakland, Calif., has been appointed a member of the electrical committee of the National Fire Protection Association. **Claude W. Mitchell**, electrical engineer of the Board of Fire Underwriters of the Pacific, San Francisco, is the other member from the Pacific Coast.

Col. H. G. Winsor, recently appointed personnel officer of the Puget Sound Power & Light Company, Seattle, Wash., has come to that company with a long record in public and military service. He is a native of Massachusetts, and beginning in 1893, spent twelve years as electrical inspector in Brockton, Mass. During that time he completed a course in electrical engineering. This was followed by two years in Houghton, Mich., in electrical engineering and construction work, and six years, from 1907 to 1913, with the Minneapolis General Electric Company, as chief inspector. In 1913 he moved to Tacoma, Wash., where for the last twelve years he has held positions with the Tacoma Railway & Power Company and the Puget Sound Electric Railway Company, engaged in work concerned with claims and public and industrial relations. He was president of the Tacoma Chamber of Commerce from June, 1923, to December, 1924. His military career includes ten years in the Massachusetts National Guard and eight years, from 1917 to the present date, in the Washington National Guard. In the last named organization he has risen from the grade of captain to that of colonel, the rank he now holds, commanding the 146th Field Artillery. His work in his new position will have to do with all matters pertaining to the personnel of the company's organization. He will cooperate with district managers in all relationships with employees, establishment of company welfare work, mutual benefit associations, group insurance, safety, camps, picnics, athletic teams and similar activities.

COL. H. G. WINSOR

E. L. Champion, Municipal Lighting Department, Pasadena, Calif., was present at the session of the Technical Section of the Pacific Coast Electrical Association held recently in San Francisco, Calif.

Obituary

Claire P. Upson, sales manager of the States Company, Hartford, Conn., died on Dec. 6.

TRADE NOTES

The Western Electric Company, Seattle, Wash., recently dedicated its new building to be occupied by the telephone department, bringing together a number of officials of that company and of the Pacific Telephone & Telegraph Company from the entire Pacific Coast. H. B. Treat, division manager telephone department, San Francisco, Calif., acted as host, and after a luncheon at the New Washington Hotel, the guests were conducted through the new three-story building by R. M. Dewart, Seattle. A dance in the building at night concluded the entertainment. Officials of the two companies came from San Francisco, Portland, Spokane and Chicago to attend the dedication.

The Western Cross Arm & Manufacturing Company, Centralia, Wash., has been incorporated for $200,000, with Robert Gillespie, S. R. Bodine and C. D. Cunningham as incorporators.

Mullins Bros., Tacoma, Wash., on a bid of $10,400, received the contract for the electrical installation in the proposed new $255,000 intermediate school to be erected in that city.

W. C. Brown, Seattle, Wash., has opened "Bill's Electrical Shop" in the University district to carry a line of electrical appliances and engage in general electrical repairing. Mrs. Brown will cary a line of novelties in addition.

The Vaughn Electric Company, 2131-3d Avenue, Seattle, Wash., announces that after Jan. 1, it will engage in electrical contracting only and will discontinue its line of electrical appliances and fixtures.

Waffle Irons Featured at Manufacturers' Exposition.—At the Inter-City Manufacturers' Exposition held in Longview and Kelso, Wash., recently, the Puget Sound Power & Light Company had an interesting display. Electrically cooked waffles were served to between 1,000 and 1,500 persons, under the supervision of C. E. Day and E. C. Engfer. The Puget Sound Power & Light Securities Company, which handles the sale of the power company's securities, also had an exhibit, which was in charge of R. L. Southwick.

Radio Industries Corporation, New York, N. Y., has published a booklet which describes in detail the Tropadyne circuit, which is claimed to be an improvement in the super-heterodyne receiver.

W. Wesley Hicks, San Francisco, Calif., has just brought out a new type of electric water heater for use where limited quantities of water are desired and where it is desirable to keep the connected load at a low figure.

A. M. Byers Company, Pittsburgh, Pa., has issued Bulletin No. 26A, "What Is Wrought Iron?", setting forth methods of manufacture, chemical and physical characteristics, and the special advantages of the material for the manufacture of welded pipe. An interesting part of the pamphlet is that devoted to service records from old buildings equipped with Byers pipe.

The R. Thomas & Sons Company, East Liverpool, Ohio, held its annual conference of sales executives at its headquarters in that city during the first week in December. Representatives from the New York, Boston, Pittsburgh, Chicago, Seattle and San Francisco offices, as well as from the export department, were present.

The General Electric Company has issued Bulletin No. 45124, "Street Lighting Transformers." The bulletin is of thirty-two pages and is profusely illustrated. In it are described various types of General Electric constant current transformers, both indoor and outdoor, and for pole or subway mounting, individual lamp series transformers, cutouts, transformer controls and protective devices. A table of transformer capacities is also included.

The genial gentleman presented here is not demonstrating the proper demeanor that should be adopted by a member of the Smiles Club; neither is he testifying to the number of times he has been caught on Tag Day. On the contrary, he is registering pride and pleasure in the fact that his prize chickens won seventeen prizes at the Dinuba Poultry Show last February. The decorations are blue ribbons, and the smiling chicken fancier is H. G. Redfern, manager of the Dinuba district of the San Joaquin Light & Power Corporation, Fresno, Calif. His hobby is raising fancy stock for exhibition purposes, and all his spare time is spent in the 20-ft. electrically-equipped poultry farm in his back yard.

The G. F. Mitchell & Sons Company, Cleveland, Ohio, claims that an entirely new principle of agitation in washing is used in its Washrite machine. This is described in a recently issued publication, copies of which will be mailed free upon application to the company.

Crown Bituminous Corporation, San Francisco, Calif., is introducing to the market "Laykold," an emulsified asphalt with the same uses in the trade as the asphalt now in common use, with the important exception that heat is not required in its application. It is excellent for lining reservoirs and irrigation ditches, according to the manufacturer.

Pass & Seymour, Inc., Solvay, N. Y., is placing on the market a pull socket with several new and striking features. The need of keeping the chain free from live parts is met in a novel way. In-built features back of the bellmouth maintain the safety factor without snubbing attachments on the socket chain. The chain cannot accidentally unhook, and yet may be quickly attached or detached from the new chain hook when desired. The outside appearance of the P. & S. socket has not been changed by these features.

The Commercial Truck Company, which has been engaged in the manufacture of electric trucks for eighteen years, has announced that, in view of the business which has been developed in northern California and the necessity for guaranteeing service to the users of this equipment, it has decided to establish a Pacific Coast factory branch with headquarters in San Francisco, Calif., with K. I. Dazey as manager in charge of both sales and service. The office of the company will be maintained temporarily at 202 Sharon Building, although arrangements are now under way for the establishment of an electric garage and service station.

The P. A. Geier Company, Cleveland, Ohio, manufacturer of Royal electric cleaners, announced recently that for the third successive year the Pacific Coast captured highest honors in the annual sales contest conducted by the company, four of the first five contestants being Californians, and twenty of the first fifty being located in California, Washington and Oregon. Credit for this fine showing is accorded largely to Listenwalter & Gough, Los Angeles, Calif., jobbers for the manufacturer.

The Pacific Electrical Construction Company, San Francisco, Calif., was recently awarded the electrical contract on the new Alamo school to be erected in that city.

The Wagner Electric Corporation, St. Louis, Mo., has recently published a well illustrated bulletin, No. 140, on its line of transformers.

Curtis Lighting, Inc., of California, has been organized to handle the business of **Curtis Lighting, Inc.,** of Chicago, Ill., in California. Mr. Curtis, president of the Chicago company, will be president of the California company, and F. S. Mills will be vice-president and general manager. The new company has opened a studio at 3113 West Sixth Street, Los Angeles.

Packard Electric Company, Warren, Ohio, announces the completion of the designing of a full new line of steel cases for distribution transformers. The use of cast iron cases has been discontinued by this company, and all shipments are being made in the new cases. In addition to a complete line of distribution transformers, the Packard Company manufactures power transformers up to a capacity of 10,000 kva. and a full line of weatherproof metering transformers.

R. R. Rose has purchased the business of the Fox Electric Company, Oceanside, Calif., and has opened a new store under the firm name of the Rose Electric Company, at Second and Freeman Streets. Mr. Rose will increase the appliance stock and, in addition to general electrical contracting, will specialize on industrial work.

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Journal of Electricity

Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES

EDITORIAL

PROGRESS

BACON, or whoever it was who wrote Shakespeare, caused King Richard III to say, "Now is the winter of our discontent made glorious summer by this son of York." Leave out the duke and substitute Jupiter Pluvius, the sometimes benign and sometimes malevolent deity of rain and snow, and you have the picture of the West today.

SCIENTISTS tell us that it is water, rather than oxygen, that sustains life. Certainly it is the life-giving fluid of the electrical industry, and equally so of agriculture, the basic industry upon which the prosperity of the West depends.

THE transition between drought and plenty is disclosed graphically in this issue. Ordinarily, it may be stated that in round numbers, $150,000,000 per annum in betterments of central stations will be the program for the eleven Western states for an indefinite period. The year 1924 exceeded that sum by reason of the marked increase in steam installations, while the estimates for 1925 aggregate no less than $221,812,500.

EXPRESSED in terms of kva. to be installed, the story is even more striking. Some 382,000 kva. was added to the lines in 1924, of which 243,000 kva. was hydro and 139,000 was steam. For 1925 the plans call for 443,000 additional kva., of which 367,000 kva. will be hydro and 76,000 will be steam. In estimating cost, $500 per kilowatt installed is the factor used to cover plant, transmission lines and distribution equipment.

THESE figures contemplate merely the equipment for the generation of electrical energy; there remain the apparatus and appliances for its use. Truly, there is no exaggeration in the expression often heard, that the West is an electrical market exceeding a billion dollars annually.

THE publishers of the Journal take pleasure in presenting these figures to their readers. The most casual study of the story cannot do other than serve as an inspiration and a stimulus to the energies of every man in the industry.

THERE is no place in the picture for the laggard, the dull-witted or the unimaginative. But for him who has the ability to grasp the opportunity and carry it through to its ultimate, there are great things in store. Here's to the West, and the men of the West, the builders of an empire of happy men and women, and their servant, never-failing Electricity.

Skagit Controversy Points Out Fallacy of Municipal Operation

RUMBLINGS reach our ears from the North and we learn that the powers that be in Seattle are in verbal turmoil as to what to do in the further development of the Skagit. That they are all convinced that some additional development should be undertaken at once seems apparent. The argument has to do with which of two principal projects should come first, with councilmen and officials grouping themselves into two factions each supporting its favorite. Surely this is none of our affair. As long as the fight is confined to the politicians, the Journal of Electricity is not particularly interested. It is interested in the constructive development of the electrical industry on the Coast, and as soon as Seattle decides what it is going to do, the Journal will make every effort to present the true facts in an unbiased manner.

We cannot help commenting on the situation, however, because it exposes so admirably one of the evils of municipal operation. Evidently when a city official said in 1918 that a 50,000-hp. plant could be built at the Gorge Creek site for $5,000,000, the ultimate development had not been thoroughly planned. Now that approximately $13,000,000 has been spent on a plant that can produce only slightly more than 50,000 hp. for part of the year, and less than half of that during the balance, it is logical that officials should concern themselves with the problem of making the enterprise, in which the credit of the city is pledged, produce an amount of energy per dollar invested comparable with private enterprises of a similar kind.

The nonchalance with which the politicians speak of the $8,000,000 Ruby development or the $5,000,000 Gorge dam, nay, the very glibness with which these round numbers roll off the tongues of the guardians of the public treasury, has tended to rouse Seattle citizens from apathy. These people, secure in the knowledge that $13,000,000 has just been spent, are befuddled in mind with argument about dams, storage reservoirs, pressure tunnels and what not, all requiring tidy little bond issues, and are beginning to ask what it is all about. Indeed, they are entitled to know, since it is they, and not the politicians, that will suffer most in the event a mistake is made.

The Seattle Times makes a few pertinent inquiries indicative of the state of mind of the man in the street in Seattle, as follows:

"In view of the haphazard way in which the city authorities are handling the Skagit enterprise it would be reasonable to ask them to ascertain definitely:

"1—How much will the Skagit project cost?

"2—Does anybody know for sure which part of the unfinished work should be tackled first?

"3—When will the Skagit be completed, if ever?

"4—How long will it be, with loose calculations and reckless financing, before the utility bond holders foreclose on our light plant and take it away from us?

"Is'nt it about time the city council engaged a disinterested commission of competent engineers to pass upon questions which are clearly beyond the capacity of city authorities to settle?"

Assuredly, the latter suggestion has merit, in the circumstances.

The Importance of Accident Prevention

ACCIDENT prevention appears to be one of the goats among the activities of the electric utility companies. When times are good and the rush of affairs not too great, this important phase of industrial welfare receives an approximation of its just due in the way of recognition and official support. Unfortunately though, when times are not so good, educational activities and preventive programs designed to reduce accidents among employees are the first to suffer curtailment.

To be successful and yield dividends an educational program must be continuously and vigorously prosecuted in a constructive and consistent manner. An intermittent program is little better than no program at all for its teachings are forgotten or unheeded when educational work stops and each time it is renewed a fresh start must be made.

The accident prevention bureau had the lowest percentage attendance of any of the bureaus represented at the recent conclave of the Technical Section of the Pacific Coast Electrical Association at San Francisco. This is poignantly indicative of the fact that somewhere, somehow the powers that be do not seem to realize the full value of this work to the business of manufacturing and selling kilowatt-hours.

Accident prevention is no longer merely a fad for professional reformers. Nor is it the fussy, interfering program that some seem to believe. It is an important phase of industry, designed to reduce mortality and save dollars. The excellent work done by the accident prevention bureau of the P.C.E.A. deserves recognition and serious consideration by executives of the utility companies and a fuller measure of support than it has received in the past.

Protecting the Interests of the Public

THAT the utilities in practically every state in the Union are held strictly accountable to public bodies for every dollar received or spent is a fact which might be brought home more forcibly to the public at large. In a recent address before the annual Oregon Business and Industrial Conference, Franklin T. Griffith, president of the Portland Electric Power Company and the National Electric Light Association, emphasized this point when he said:

"In Oregon, as in nearly all other states of the Union, the operations of electric service companies are subject to state regulation. Every dollar received and expended by a utility must be accounted for by a system of accounts established by the commissions, and not by the companies, to insure a full disclosure of all facts and eliminating the possibility of false or misleading figures. The rates to be charged by the electric companies for service ren-

dered are fixed by the public service commissions, which are, in all cases, charged with the duty of establishing such rates reasonably, without discrimination, as between customers operating under similar circumstances and conditions, and so as to afford only a reasonable return upon the value of the property of the utility devoted to the public service. The valuation upon which rates are based, it should be borne in mind, is a valuation of the property of the utility and not in anywise controlled by the number of shares of stock the utility may have outstanding."

The idea has been prevalent and still is with many of our citizens that the public service commissions are controlled by the utilities and decide only in their behalf. Hardly a state election passes without some reference by the politicians to these bodies as "corporation hirelings." The electric service companies must leave no stones unturned in trying to discourage this impression and leave in its place a true idea of affairs, namely, that utility commissions are public bodies, appointed or elected for the sole purpose of protecting the public interests.

Omar and the Central Station

Myself when young, did eagerly frequent
Doctor and sage, and heard great argument
About it and about, but ever more
Came out no wiser than when in I went.

Omar might have been the man in the street who uses central station service but feels that the corporation is robbing him upon general principles. The only remedy is education. That is realized by central stations and they are making a start. In planning a campaign, however, all points and methods of attack must be considered. Here the central stations have fallen down. Public ownership of securities is receiving in large measure the greatest attention. And that is good. Giving the public information about physical elements of plants and properties is receiving considerable attention. And that is good. But aren't there some other things to do?

How about the main issue, viz., the justification of the price asked for the product; in other words, the price per kilowatt-hour for electrical service? There are two points of interest here, the audience and the argument. The audience consists of present customers. They can be reached by paid advertising, by inspired news and magazine articles and, to a very limited extent, by personal contact. These methods are good, but there is one method that is very good indeed and that is to reach the customer through his children. How many cars are sold to families by virtue of the interest aroused in small boys twelve to fifteen years old? Many. The school children can be reached, preferably by pamphlets issued in loose-leaf form. This point of attack is of great importance, and the attack should be directed at pupils in grade schools, high schools and colleges.

The argument should take the form of presenting the principles underlying any business, and many examples should be given based upon forms of business not related to public utilities before ever mentioning the latter. These examples should make the point that the net return on money invested is a thing of great importance, and should illustrate capital investment, fixed charges, operating expense, markets, competition, risks, chances for growth. Then the story of the central station can be made one of intense interest, bringing out forcibly the large amount of engineering and business research that must be the basis for starting, and describing the various steps taken in constructing and developing a property, destined to serve and satisfy the public and to earn a fair return. There is no doubt as to the interest such a campaign would arouse among the younger people, and their convictions thus formed would soon be communicated to their parents. Pamphlets are suggested, but they could readily be supplemented by talks given by central station representatives in the schools, by tours of inspection of generating stations, by essay contests with substantial prizes, such as the National Home Lighting Contest just completed.

The contest is one of the most effective steps that have been taken by the electrical industry to educate the public. However, it should be merely a step in a larger and broader campaign.

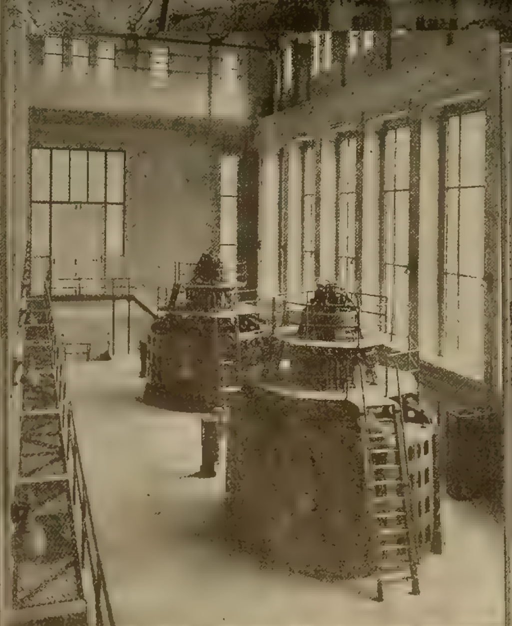
Cooperation, Not Price-Fixing, Boosts Sales

ELECTRICAL contractors' trade associations are without exception endeavoring to work constructively for the benefit of their members. Realizing the weaknesses inherent in any attempt at price regulation, they have generally refrained from consideration of such feature. However, one association had an experience that will be of interest to all others and that should serve as a warning to association members who are endeavoring to enforce price control.

A large central station company thought it would be practical to merchandise convenience outlets in the same way that electrical appliances are sold, namely, by advertising a definite price. After some meetings and consideration of the situation, the local contractors agreed on a price of $8 for the first outlet, $14 for two outlets and $18 for three outlets installed at one time. Experience, however, proved that they were too careful in the price they fixed and that others not in the association immediately began installing outlets at less than these prices.

The net result of all this has been that the idea of a set price per outlet has been discontinued, and contractors are now installing them at selling prices in accordance with the job in hand. The sale and installation of convenience outlets in this particular locality have shown considerable increase, this increase undoubtedly having been affected by the fact that some of the electrical contractors sent out individual pieces of direct-mail advertising. An effort is being made by the power company to induce all contractors to tie in with the central station advertising and also to influence electrical contractors to try the house-to-house canvassing sales method. It is deeply significant that the sale of convenience outlets can be materially increased by concerted effort and that price-fixing is most likely to prove a boomerang.

MANY notable hydroelectric installations have been made in the Pacific Coast states during the past year. Above is the Big Creek No. 1 plant of the Southern California Edison Company where a 25,000-kw. unit is being added. Below is the Long Lake plant of The Washington Water Power Company brought up to full capacity of 94,000-kw. with the addition of a 17,500-kw. unit. Top left shows the Roosevelt plant, Salt River Valley Water Users' Association, where a 7,500-kw. generator has been installed. Next is the Soda Springs plant of the Utah Power & Light Company. This station has a capacity of 14,000 kw. The White River plant of the Puget Sound Power & Light Company has been raised to its ultimate capacity of 86,000 kw. with the addition of a 20,000-kw. unit. At the bottom is the interior of Seattle's Gorge plant showing the two 30,000-kw. units.



Power Company Construction Programs Set New Records for 1924-25

THE installed capacity of the electric service companies of the eleven Western states was increased 15 per cent during 1924 and the same ratio will be maintained during 1925 when 443,625 kva. will be added to the lines. The 1924 development program involved expenditures of approximately $191,361,500 or $19 per capita. The 1925 program will require $221,812,500. Many new transmission lines were constructed during the year and several others are contemplated.

ADDITIONS to the installed generator capacity of the electric service companies of the eleven Western states during 1924 totaled 382,723 kva., exceeding by 50 per cent that of any previous year. Hydroelectric development was responsible for 243,223 kva., closely approximating the prediction made in 1923 that a total of 250,000 kva. would be installed in 1924. Additions to existing steam plants and the construction of new plants added 139,500 kva. to the lines during the year. On the basis of a total installed capacity of 2,584,875 kw. as of Feb. 1, 1924, the year's developments represent an increase of approximately 15 per cent.

A survey of the construction programs of the utilities at the present time shows that during 1925 there will be added to the lines 443,625 kva. in new capacity. Of this amount hydroelectric construction represents 367,625 kva. and steam plant construction 76,000 kva. As was the case in 1924, this will be an increase of 15 per cent in the total installed capacity. Already there is definitely scheduled a total of 253,000 kva. in hydroelectric construction for 1926. The construction program for the eleven Western states for the four-year period 1922-25, inclusive, is shown in the following table:

Year	Hydro (kva.)	Steam (kva.)
1922	138,675	No record
1923	185,500	No record
1924	243,223	139,500
1925	367,625	76,000
Totals	935,023	215,500
Total steam and hydroelectric	1,150,523 kva.	
Average per year for 4-year period	287,640 kva.	
Average percentage increase	13 per cent	

Using the conservative average of $500 per kilowatt for dams, tunnels, power houses, power-house equipment, substations, transmission and distribution lines, the 1924 construction program represented an expenditure of $191,361,500. This is approximately $19 for every man, woman and child in the eleven Western states. The 1925 program on the same basis represents a total outlay of $221,812,500 or $20 per capita when the increase in population during the past year is taken into consideration. In 1920 the Journal of Electricity made a comprehensive survey of the light and power industry of the eleven Western states and arrived at the conclusion that the ten-year development program of the utilities from 1920 to 1930 would involve the expenditure of approximately one billion dollars, or one hundred million dollars a year. From present indications the 1920 estimate will be exceeded by more than fifty per cent.

In its report for 1920 the water power development committee of the National Electric Light Association analyzed the annual expenditure for new construction and extensions of several of the Western power companies. Averages arrived at showed that 41.249 per cent of the annual budget was spent for distribution equipment; 16.181 per cent spent for transmission equipment and 42.57 per cent spent for production equipment. These average percentages were further subdivided into classifications of specific equipment. Applying the averages to the construction budget of approximately $221,812,500 for 1925 as set down in a preceding paragraph gives the following detailed table of expenditures for 1925:

DISTRIBUTION (41.249%)		$91,494,438
On consumers' premises (0.2%)	$ 443,625	
Telephone lines and equipment (1.35%)	2,994,468	
Commercial lamps and equipment (0.049%)	108,688	
Municipal street lighting (0.6%)	1,330,875	
Meters (4.3%)	8,537,937	
Electric services (1.6%)	4,552,000	
Line transformers and devices (7.5%)	16,636,096	
Miscellaneous equipment (0.05%)	110,906	
Substation equipment (3.5%)	7,763,437	
Substation buildings and structures (0.5%)	110,906	
Overhead systems (11.6%)	26,727,250	
Poles and fixtures (10.0%)	22,178,250	
TRANSMISSION (16.181%)		$35,891,480
Miscellaneous equipment (0.001%)	2,218	
Substation equipment (3.4%)	7,581,625	
Substation buildings and structures (0.28%)	621,075	
Overhead systems (7.5%)	16,685,937	
Poles and fixtures (5.0%)	11,090,625	
PRODUCTION (42.57%)		$96,425,581
Miscellaneous (0.1%)	22,181	
Steam power plant equipment (3.5%)	7,763,437	
Boilers and turbines (2.5%)	5,545,312	
Hydro power plant equipment (4.8%)	10,647,000	
Power plant buildings and general structures (4.67%)	12,576,768	
Dams, reservoirs, tunnels and penstocks (27.0%)	59,870,883	

1924 Hydro Construction Reviewed

Hydro construction during 1924 was largely confined to the addition of units in existing plants. However, there were completed some notable plants, chief among which were the Gorge plant of the City of Seattle, the Oak Grove plant of the Portland Electric Power Company, the Leevining Creek plant of the Southern Sierras Power Company, the Soda Springs plant of the Utah Power & Light Company and the El Dorado plant of the Western States Gas & Electric Company. The Gorge plant, with an installed capacity of 60,000 kva., is at present producing only 40,000 kva. owing to the fact that a temporary timber crib diversion dam has been constructed pending the building of a future dam 250 ft. high. The Oak Grove plant is unique in that it contains the highest head reaction turbine in the world, a 35,000-hp. unit operating under an effective head of 860 ft. Two additional units will be installed at this site at some future date.

The Leevining Creek plant is typical of the high-head installations in the high Sierra of California. It contains a 14,000-hp. unit operating under an effective head of 1,531 ft. The Soda Springs development is part of the Bear River project of the Utah Power & Light Company. The plant is of the low-head type and has an installed capacity of 14,000 kw. During the past year the Western States Gas & Electric Company completed the first unit of its American River development, the El Dorado plant. This station has an initial capacity of 20,000 kw. Its two units operate under a head of 1,910 ft. The first of a series of plants in conjunction with a large mining project was completed during the year by the Yuba River Development Company. Its initial plant at Bullards Bar, with a capacity of 7,500 kva., has been leased to the Pacific Gas and Electric Company.

New units to existing stations included a 13,125-kva. generator in the Stave Falls plant of the British Columbia Electric Railway Company, Ltd., that will be placed in operation early in 1925. This unit, the fifth, brings this power house up to its ultimate capacity of 52,500 kw. A third unit was installed in the Caribou plant of the Great Western Power Company, increasing the capacity of this station to 66,000 kw. Plans have been announced for the addition of a fourth unit during the coming year. Two 7,500-kva. units were installed in the American Falls plant of the Idaho Power Company. The development at the White River plant of the Puget Sound Power & Light Company was completed with the addition of a 30,000-kva. unit, giving this station a total capacity of 86,000 kw. Similarly, the Long Lake plant of The Washington Water Power Company has been completed with the addition of a fourth 17,500-kva. unit. The capacity of this plant is now 94,000 kw.

Record Will Be Set in 1925

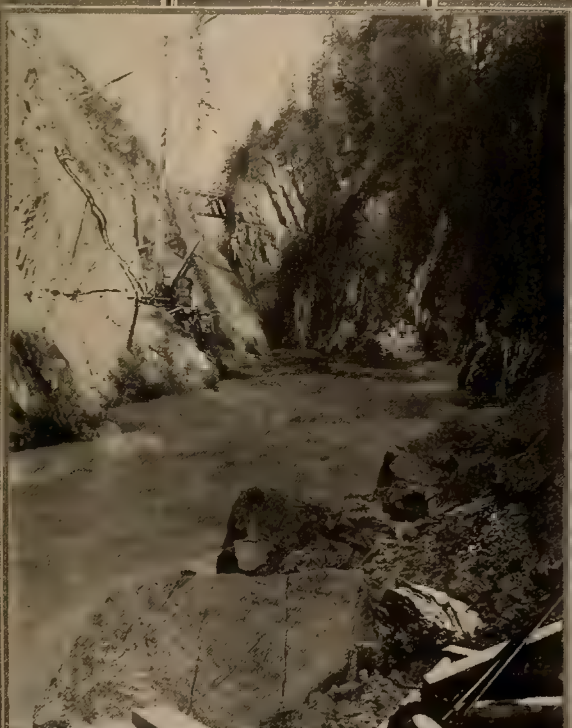
The year 1925 will establish a record in hydroelectric development because of the addition of 367,625 kva. to the lines of the electric service companies. The bulk of this capacity will come from the Pit No. 3 plant of the Pacific Gas and Electric Company and the Moccasin plant of the City of San Francisco. Pit No. 3 will contain three 27,000-kva. units operating under a head of 280 ft. Present plans call for its completion by July of this year. Moccasin power house is a part of San Francisco's Hetch Hetchy development. At the present time it is planned to have its four 20,000-kva. units operating by April of this year.

In addition to these two notable plants, the City of Tacoma expects to complete its Cushman No. 1 plant with an installed capacity of 40,000 kw. The interesting feature of this development is the immense reservoir with its 450,000 acre-ft. storage which will result from the construction of a 275-ft. dam across a narrow canyon below Lake Cushman. The Montana Power Company will complete its 12,500-kva. Mystic Lake plant early in the year. Construction is proceeding rapidly on the Baker River development of the Puget Sound Power & Light Company on the Baker River, in northwestern Washington, where Stone & Webster are constructing a 39,000 kva. plant for this utility.

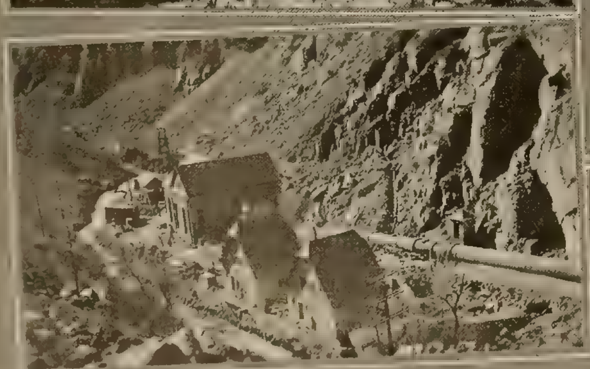
Although the Southern California Edison Company will add a unit to each of two of its plants on Big Creek, the most important phase of this utility's construction program is the Florence Lake tunnel, which will be completed some time during March. This 15-ft. bore has been driven 13½ miles through solid granite and has been under construction since the fall of 1920. It will connect the South Fork of the San Joaquin River with Huntington Lake, creating an immense storage system above the chain of Big Creek plants. With its capacity of 1,500 sec.-ft. of water, it will be an important factor in the Big Creek development. Its importance can be judged from the fact that during 1924, the dryest year in the history of the California power companies, sufficient water flowed by its portal to fill Huntington Lake, the storage reservoir that feeds the Big Creek plants, more than full. Additions to the Big Creek plants during the year will consist of a 25,000-kva. unit in Big Creek No. 1 and a 16,000-kva. in Big Creek No. 2. These two plants, which will then be developed to the ultimate, will have capacities of 73,000 and 64,000 kw., respectively.

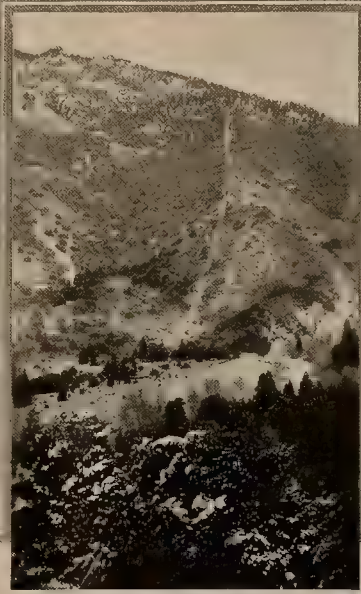
Several important developments will begin in 1925. Announcement has just been made by the Pacific Gas and Electric Company that work will begin on the four-mile tunnel in conjunction with Pit No. 4 power house. This plant, which will cost approximately $15,000,000, will be located below Pit No. 3. It will develop approximately 125,000 kva. under a head of about 400 ft. The Utah Power & Light Company will commence work on its Cutler plant on the Bear River 80 miles north of Salt Lake City. A total of 30,000 kw. will be developed at this site under a head of 128 ft. Work will start on this project March 1. The Northwestern Electric Company has announced that it may start construction during 1925 of a 30,000-kw. plant at its Yale site on the Lewis River. The Salt River Valley Water Users' Association, which completed its development at the Roosevelt plant with the addition of a 7,500-

ONE of the largest plants under construction in the West at the present time is the Pit No. 3 plant of the Pacific Gas and Electric Company. A view of work to date on this 75,000-kw. station is shown above. Below is a view of the Baker River in Washington at flood stage at the site of the dam which is being built for the Puget Sound Power & Light Company as part of a 39,000-kw. development. Top right shows a view of the Stave Falls plant of the British Columbia Electric Railway Company, Ltd., where a 13,125-kw. unit is being installed. With this unit added the capacity of this plant will be 52,500 kw. In the center is a picture showing progress to date on the Exchequer dam of the Merced Irrigation District where a 30,000-kw. plant will be built. At the bottom is the Moccasin plant of the City of San Francisco. This plant, a unit in the Hetch Hetchy project, will have capacity of 80,000 kw.

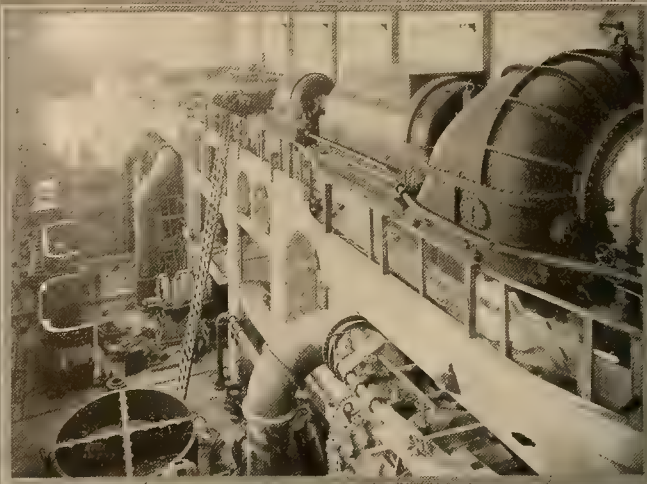


SOME of the plants completed during 1924 are shown in the accompanying views. Above from left to right are the 25,500-kw. Oak Grove plant of the Portland Electric Power Company, the Caribou plant of the Great Western Power Company of California where a 22,000-kw. unit has been added and the 20,000-kw. El Dorado plant of the Western States Gas & Electric Company on the American River. The Great Western plans to add a fourth unit to the Caribou plant during this year. Immediately at the left is the Bullard's Bar plant of the Yuba River Power Company. Below this is a view of the East Side plant of The California Oregon Power Company. At the bottom are views of two of the newest stations of The Southern Sierras Power Company. At the left is the 6,250-kw. Adams Main plant and at the right the 12,500-kw. Leevining Creek plant.

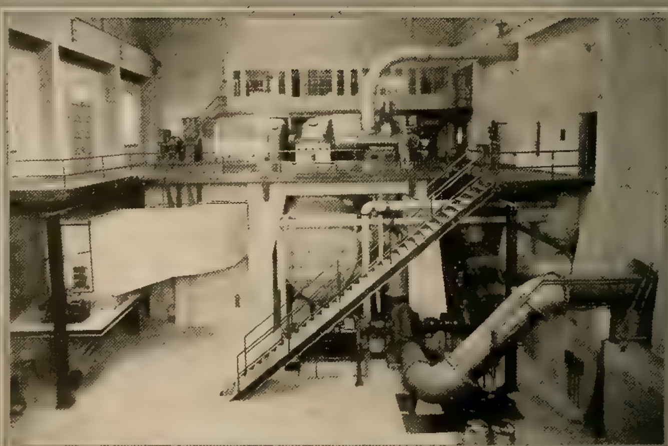




THIS year will see a continuation of the active hydroelectric construction which marked 1924. Above is the Helms dam site at El. 8,000 on Kings River project of the San Joaquin Light & Power Corporation. Below is the Yale site of the Northwestern Electric Company on the Lewis River, Wash., where a 30,000-kw. plant will be constructed. Top right shows the site of the Forest Home plant of The Southern Sierras Power Company together with the clearing for the 6,064-ft. penstock. Next is a view of the site of the Copco No. 2 plant of The California Oregon Power Company. The next photo shows construction work on the 13½-mile Florence Lake Tunnel of the Southern California Edison Company to be completed in March. At the bottom is a view of the Horse Mesa site on the Salt River in Arizona where the Salt River Valley Water Users' Association will construct a 34,000-kw. plant.



STEAM construction has been active during the year. Above are two views of the Long Beach plants of the Southern California Edison Company. At the right is a view showing Long Beach No. 1 and No. 2, the new station. At the left is an interior of No. 2 showing the two 35,000-kw. units, one of which is operating and the other which will be on the line very shortly. At the right is an airplane view of the 215,000-kw. Seal Beach station of the Los Angeles Gas & Electric Corporation, where the first 30,000-kw. unit is being installed. The interior view shows the new 15,000-kw. Glenarm St. station of the City of Pasadena. Lower left is an air view of the new Pueblo plant of the Southern Colorado Power Company. Lower right shows the Young's Bay plant of the Pacific Power & Light Company where a new unit has been added.



kva. unit during 1924, has ordered equipment for a 34,000-kw. plant at Horse Mesa on the Salt River in Arizona. Work will be continued by the San Joaquin Light & Power Corporation on its Balch plant on the Kings River.

More detailed information on all of the above plants will be found in the table on pages 88 and 89.

Steam Capacity Added in 1924 is 139,500 Kva.

The major portion of the 139,500 kva. of steam capacity added to the lines during the last year was installed in California. This was due primarily to the power shortage during the summer, and some remarkable records in construction were made. This is particularly true in the case of the Long Beach No. 2 plant of the Southern California Edison Company. One 35,000-kw. unit has already been placed in operation in this station, and another will go into operation shortly after Feb. 1, 1925. A record was established in the case of the 12,500-kw. unit installed at the Sacramento steam plant of the Pacific Gas and Electric Company. This unit was in service within four months from the time plans were conceived for its installation. Three small units totaling 22,000 kw. were also placed in the Long Beach No. 1 steam plant of the Southern California Edison Company in record time. The Los Angeles Gas & Electric Corporation put into operation a 17,500-kw. turbo-generator during the summer to aid in supplying power to consumers in southern California. Similarly a 10,000-kw. unit was placed in the Glenarm Street station of the City of Pasadena in a new station that has an ultimate capacity of 25,000 kw. During the power shortage many isolated plants were leased and several obsolete plants rehabilitated and placed in operation by the utilities in southern California. The operation of these plants was discontinued after the first heavy rains.

The Public Service Company of Colorado placed in operation the first unit of 20,000 kw. in a new station at Boulder which will ultimately house 100,000 kw. in turbo-generators. The Long-Bell Lumber Company erected an 18,000-kw. steam plant at Longview, Wash., in connection with its lumbering operations in that section. The plant furnishes energy to the town of Longview and will ultimately be connected to the transmission system of the Pacific Northwest. Small units were installed in existing stations by the Pacific Power & Light Company at Astoria, Ore., the Mountain States Power Company at North Bend, Ore., and the Gray's Harbor Railway & Light Company at Gray's Harbor, Wash. A 20,000-kw. unit was placed in the Jordan steam plant of the Utah Power & Light Company at Salt Lake City, raising the capacity of this station to 36,000 kw.

The first 30,000-kw. unit of what will ultimately be the largest steam electric generating station west of the Rockies will be placed in operation by the Los Angeles Gas & Electric Corporation during the year at its new plant at Seal Beach, Calif. The ultimate capacity of the station will be 215,000 kw.

Further information regarding the steam installations will be found in the table on page 90.

Many Transmission Lines Built

Construction of 220-kv. transmission lines during the year was confined to a 9-mile extension to the Pit River line of the Pacific Gas and Electric Company from its Pit No. 3 plant. However, 1925 will witness the beginning of work on a third 220-kv. line by the Southern California Edison Company from its Big Creek project to the Los Angeles metropolitan district. This line will be approximately 250 miles in length. The merger of the San Joaquin Light & Power Corporation and the Great Western Power Company of California brought forth the announcement that a 220-kv. line will be built from Sacramento to Merced to provide a high-capacity direct interconnection between these two companies.

Completion or construction of hydroelectric projects during the year necessitated the building of several important high tension lines. Work on the 154-kw. line of the City of San Francisco from its Moccasin power house to Newark near San Francisco, is nearly complete. This twin-circuit line is of steel-pole construction and is 240 miles long. During the year the City of Seattle completed a single-circuit 165-kv. line 105 miles in length from its Gorge plant to Seattle. The California Oregon Power Company has completed a 110-kv. line from Delta, Calif., to its Copco No. 2 plant. This line forms an important link in the Pacific Coast interconnected system, being the second tie between this company and the Pacific Gas and Electric Company. The Portland Electric Power Company placed in operation a 57-kv. line designed to operate ultimately at 110-kv. between its Oak Grove plant and Cazadero, Ore.

Important Ties and Extensions Made

During the year an important tie between the systems of The Southern Sierras Power Company and the San Diego Consolidated Gas & Electric Company across the southern end of California was completed. One hundred miles of 88-kv. line were built by the former utility and 17 miles by the latter.

In the Pacific Northwest both the Puget Sound Power & Light Company and The Washington Water Power Company made important extensions and additions to their 110-kv. transmission systems. In all 268 single-circuit miles of line were constructed by these two utilities. Considerable high tension line was also built by the Pacific Power & Light Company.

Two important high tension lines have already been announced for construction during the coming year. The Utah Power & Light Company will build 80 miles of 130-kv. line from its Cutler project to Salt Lake City and the City of Tacoma will build 44 miles of 110-kv. line from its Lake Cushman development to Tacoma.

The prediction has been made that during 1925 interconnections will be made which will tie together all of the transmission systems of the Pacific Coast companies, giving an interconnected system extending from the Mexican to the Canadian borders and eastward into Montana. At the present time two small gaps exist in the system.

Some Additions to Hydroelectric Generat

COMPANY	PLANT	LOCATION	DAMS			CANALS AND TUNNELS			PENST	
			Type	Reservoir Capacity (Acre-ft.)	Height (Ft.)	Type	Dia. (Ft.)	Length (Ft.)	Dia.	Leng
Bridge River Power Company	Bridge River	Bridge River, B. C.	Log Crib	Diversion	45	Tunnel	....	13,200	....	2,1
British Columbia Electric Railway Company, Ltd.	Stave Falls (Fifth Unit)	Stave Falls, B. C.	Concrete	471,000	55	....	....	......	20– 13′	....
British Columbia Electric Railway Company, Ltd.	Alouette	35 Mi. east of Vancouver	Earth fill	170,000	63	Tunnel	16	3,550	13′ 12′	....
The California Oregon Power Company	East Side	Klamath Falls, Ore.	Buttress	360,000	15	Canal	....	670	12′	3,054
The California Oregon Power Company	Copco No. 2	Klamath River, Calif.	Gravity	....	35	Tunnels Wd. Pipe	16 16	3,545 1,345	13½′	280
City of Eugene	McKenzie (New Unit)	McKenzie River, Ore.	*	*	*	*	*	*	8′	....
City of San Francisco	Moccasin	Tuolumne River, Calif.	Gravity Arch	206,000	344	Concrtd. Tunnel	10¼	......	104″ 54″	....
City of Seattle	Gorge	Skagit River, Wash.	Crib Arch (future)	13,000	240	Concrtd. Tunnel	20½	11,000	136″	....
City of Seattle	Ruby	Skagit River, Wash.	Arch	1,300,000	480	Concrtd. Tunnel	28	18,500	....	....
City of Tacoma	Cushman No. 1	Lake Cushman, Wash.	Constant Angle Arch	450,000	275	Concrtd. Tunnel	17	700	....	....
City of Tacoma	Cushman No. 2	Lake Cushman, Wash.	Constant Angle Arch	6,000	180	Concrtd.	....	9,000	....	....
Deschutes Power Company	Cove (Second Unit)	Crooked River, Ore.	....	....	......	....	....	......	12′	....
Great Western Power Company	Caribou (Third Unit)	Feather River, Calif.	Hydraulic Fill	50,000	49 Addtl.	*	*	*	66– 42″	....
Great Western Power Company	Caribou (Fourth Unit)	Feather River, Calif.	Hydraulic Fill	1,300,000	45 Addtl.	*	*	*	66– 42″	....
Idaho Power Company	American Falls	Snake River, Idaho	Gravity	7,500	5– 20	None	....	......	....	....
Merced Irrigation District	Exchequer	Merced River, Calif.	Constant Angle Arch	....	310	....	....	......	96″	....
Montana Power Company	Mystic Lake	West Rosebud River, Mont.	....	20,000	25	Tunnel Wd. Pipe	.... 56″	1,000 9,000	48″ 44″-42″	....
Northwestern Electric Company	Yale	Lewis River, Wash.	Gravity	36,000	160	Tunnel	20	500	13′ 13′	18 21
Pacific Gas and Electric Company	Pit No. 3	Pit River, Calif.	Gravity	32,300	110	Concrtd. Tunnel	19	20,998	129– 108″	55
Portland Electric Power Company	Oak Grove	Clackamas River, Ore.	Arch	Diversion	60	Tunnels Stl. Pipe	9 9	1,520 33,500	8′- 6′	....
Puget Sound Power & Light Company	White River (Fourth Unit)	White River, Wash.	*	*	*	*	*	*	....	....
Puget Sound Power & Light Company	Baker River	Baker River, Wash.	Arch and Gravity	70,000	250	Concrtd. Tunnel	22	1,600	78″	15
Salt River Valley Water Users' Association	Roosevelt	Salt River, Ariz.	*	*	*	*	*	*	10′	....
Salt River Valley Water Users' Association	Horse Mesa	Salt River, Ariz.	Arch	300,000	300	....	....	......	10′	35
San Joaquin Light & Power Corporation	Balch	Kings River, Calif.	Rock Fill	40,000	150	Tunnel	12	19,600	50– 30″	.....
Southern California Edison Company	Big Creek No. 1	Big Creek, Calif.	*	*	*	*	*	*	54– 24″	.....
Southern California Edison Company	Big Creek No. 2	Big Creek, Calif.	*	*	*	*	*	*	42– 24″	.....
The Nevada-California Power Company	Leevining Creek No. 1	Leevining Creek, Calif.	Rock Fill	12,905	10	Tunnel Stl. Pipe	.... 48″	1,834 2,523	44– 28″	3,74
The Southern Sierras Power Company	Adams	Mono County, Calif.	Concrete	Diversion	......	Flume	....	625	84– 72″	3,21
The Southern Sierras Power Company	Forest Home	San Bernardino County, Calif.	Concrete	Diversion	......	Wood Pipe	1– 1½	29,550	24– 18″	6,064
Turlock Irrigation District	La Grange	Tuolumne River, Calif.	Gravity	Diversion	......	....	14	......	7– 5′	20
Utah Power & Light Company	Soda Springs	Bear River, Ida.	Gravity	15,500	......	....	....	......	....	....
Utah Power & Light Company	Cutler	Bear River, Utah	Gravity Arch	20,000	110	Steel Pipe	18	1,000	14′	....
Washington Water Power Company	Long Lake (Fourth Unit)	Spokane River, Wash.	*	*	*	*	*	*	14′	24
Washington Water Power Company	Oroville (Second Unit)	Similkameen River, Wash.	*	*	*	Wood Pipe	7	745	7′	8
Western States Gas & Electric Company	El Dorado	American River, Calif.	Earth Fill	32,900	......	Ditch Flume Tunnels Wd. Pipe	....	90,645 23,390 653 11,180	54– 28″	5,25
Yuba River Power Company	Bullard's Bar	Yuba River, Calif.	Constant Angle Arch	32,000	183	Steel Pipe	8½	300	8½– 6′	30

*Existing structures will be used.

†Abbreviations used are: A.-C., Allis-Chalmers Manufacturing Company; G. E., General Electric Company; West., Westinghouse Electric & Manufacturing Company; Pelt., Pelton Water Wh I. P. M., I. P. Morris Department William Cramp & Sons Ship & Engine Building Company; Worth., Worthington Pump & Machinery Corporation; W. S. M., Wellman-Seaver-Morgan Company; Morgan Smith Company.

nts in the Eleven Western States 1924-25

Ft.)	PRIME MOVERS			GENERATING UNITS			PLANT CAPACITY (kw.)			TRANSMISSION LINES			
ffective	No.	Capacity (hp.)	Maker	No.	Capacity (kva.)	Maker	Present or Proposed	Ultimate	TRANSFORMERS	Length (mi.)	Voltage (kv.)	Type	PRESENT STAGE OF DEVELOPMENT
1,140	3	25,000	......	3	20,800	......	56,000	335,000	....	130	150	....	Proposed
113	1	15,000	A.-C.†	1	13,125	G.E	52,500	52,500	3-5,500 kva. G.E.	*	*	*	To be completed April, 1925
.....	1	10,000	......	1	7,500	......	7,500	....	....	......	.....	....	Proposed
.....	1	4,250	A.-C.	1	4,000	A.-C.	4,000	4,000	1-7,000 kva.	*	*	*	Completed August, 1924.
140	2	20,000	A.-C.	2	15,000	West.	30,000	30,000	3-20,000 kva. 6,600/66,000-110,000	77½	110	Wood pole	To be completed May, 1925
.....	1	1,800	W.S.M.	1	1,875	West.	4,200	4,200	3-1,250 kva. Pitts.	13	22	....	Completed 1924
1,250	4	25,000	Pelt.	4	20,000	G.E.	80,000	120,000	13-6,667 kva. West.	98½	154	Steel Tower	To be completed March 1925
275	2	28,000 (38,000 fut.)	S.M.S.	2	30,000	West.	60,000	90,000	60,000 kva. West. 11,000/165,000	100¼	165	Wood pole	Completed Sept. 1924
.....	..	....	......	..	....	......	....	250,000	....	......	.....	....	Proposed
.....	2	25,000	A.-C.	2	20,000	A.-C.	40,000	40,000	14-6,667 kva. 13,200/110,000	44	110	....	To be completed 1925
.....	..	....	......	..	....	......	....	112,000	....	......	.....	....	Proposed
31	1	1,225	S.M.S.	1	875	G.E.	1,275	2,150	3-400 kva. G.E. 2,300/22,000	*	*	*	Completed Dec., 1924
1,074	2	15,000	A.-C.	1	22,223	G.E.	66,000	135,000	3-7,500 kva. G.E.	*	*	*	Completed 1924
1,074	2	15,000	......	1	22,000	......	88,000	135,000	3-7,500 kva.	*	*	*	To be installed 1925
.....	2	9,000	A.-C	2	7,500	A.-C.	18,750	Indefinite	15,000 kva. West.	*	*	*	Completed 1924
240	2	24,500	Pelt-Morris	2	15,625	West.	30,000	....	3-10,400 kva. G.E. 6,600/120,000 volt	20	110	....	To be completed 1926
1,050	2	7,500	Pelt.	2	6,250	West.	12,500	12,500	2-6,000 kva. West.	27	51	....	To be completed 1925
140	2	20,000	......	2	18,000	......	30,000	45,000	6-6,000 kva. 11,000/66,000	40	66	....	To be completed Jan. 1926
280	3	33,000	Pelt.	3	27,000	G.E.	75,000	75,000	9-9,000 kva. 11,000/110,000-220,000	8½	220	Steel Tower	To be completed July 1925
860	1	35,000	Pelt.	1	30,000	G. E.	25,500	76,500	3-10,000 kva. West. 11,000/66-115,000	18.7	115	Steel Tower	Completed Aug. 1924
.....	1	23,000	A.-C.	1	20,000	G.E.	86,000	86,000	3-9,000 kva. G.E. 6,600/55,000	*	*	*	Completed Dec. 1924
.....	2	20,000	A.-C.	2	19,500	G.E.	39,000	79,000	7-6,667 kva. G.E.	50	110	....	Construction started 1924
0-240	1	10,000	S.M.S.	1	7,500	West.	18,000	18,000	3-2,000 kva. Wagner 2,300/45,000	*	*	*	Completed 1924
264	3	15,280	S.M.S.	3	11,100	G.E.	34,000	34,000	10-3,700 kva. G.E. 11,000/110,000	4	110	....	Construction to start 1925
2,312	2	20,000	......	1	28,250	......	30,000	180,000	....	50	110	Steel Tower	Construction to start 1925
.....	1	35,000	Pelt.	1	25,000	West.	73,000	73,000	3-9,333 kva. G.E. 11,000/150,000	*	*	*	To be completed July 1925
.....	1	20,000	Pelt.	1	16,000	West.	64,000	64,000	3-5,833 kva. G.E. 6,600/150,000	*	*	*	To be completed May 1925
1,531	1	14,000	Pelt.	1	12,500	G.E.	12,500	12,500	3-4,200 kva. G.E. 6,600/88-152,000	17.8	100	....	Completed 1924
221	1	7,500	Worth.	1	6,250	G.E.	6,250	6,250	3-3,500 kva. West. 6,600/88,000	*	*	*	Completed 1924
1,951	1	2,800	......	1	5,000	......	2,000	2,000	3-1,500 kva.	8.2	87	Wood Pole	To be completed 1925
110	1 1	1,350 4,000	A.-C. A.-C.	2 1	500 3,000	West. A.-C.	4,000	4,000	4,000 kva. A.-C. 4,000/73,000 volt	1½	.....	....	Under Construction
76	2	10,000	A.-C.	2	8,200	G.E.	14,000	14,000	4-5,000 kva. G.E. 6,600/135,000 volt	9.54	132	....	Completed Oct. 1924
124	2	21,000	I.P.M.	2	15,000	G.E.	30,000	30,000	6,600/130,000 volt	80	130	....	Work to start Mar. 1, 1925
170	1	22,500	I.P.M.	1	17,500	G.E.	94,000	94,000	....	*	*	*	Completed 1924
78	1	2,500	Pelton	1	1,600	G.E.	5,000	5,000	3-500 kva. West. 2,300/33,000 volt	*	*	*	Completed 1924
1,750	2	14,000	A.-C.	2	10,000	G.E.	20,000	75,000	G.E.	9	60	....	Completed Jan. 1924
170	1	10,000	Worth.	1	7,500	A.-C.	7,500	15,000	3-2,500 kva. A.-C. 6,600/60,000	6¼	66	....	Completed 1924

Some Additions to Steam Electric Generating Stations in the Eleven Western States, 1924-25

COMPANY	PLANT	LOCATION	PRIME MOVERS No.	PRIME MOVERS Capacity (Hp.)	PRIME MOVERS Maker	GENERATING UNITS No.	GENERATING UNITS Capacity (Kw.)	GENERATING UNITS Maker	CAPACITY (KW.) Present or Proposed	CAPACITY (KW.) Ultimate	TRANSFORMERS	PRESENT STAGE OF DEVELOPMENT
City of Pasadena	Glenarm St.	Pasadena, Calif.	1	13,500	A.-C.	1	10,000	A.-C.	10,000	25,000	4-2,000 kva. G.E. 2,400/16,500 volt	Completed, 1924
Los Angeles Gas & Electric Corp.	Los Angeles	Los Angeles, Calif.	1	23,457	G.E.	1	17,500	G.E.	75,000	75,000	G.E.	Completed, 1924
Los Angeles Gas and Electric Corp.	Seal Beach	Seal Beach, Calif.	1	48,000	West.	1	30,000	West.	30,000	215,000	37,500 kva. West.	To be completed July 1, 1925
Public Service Company of Colorado	Lakeside	Near Boulder, Colo.	1	33,500	West.	1	20,000	West.	20,000	100,000	3-7,500 kw. West.	Completed, Jan., 1925
Southern California Edison Company	Long Beach No. 1 (New Units)	Long Beach, Calif.	1 2	13,500 8,000	A.-C. G.E.	1 2	10,000 6,000	A.-C. G.E.	69,000	69,000	....	Completed, 1924
Southern California Edison Company	Long Beach No. 2	Long Beach, Calif.	2	50,000	G.E.	2	35,000	G.E.	70,000	70,000	6-13,000 kva. G.E. 11,000/66,000 volt	First Unit Nov., 1924 Second Unit, Feb., 1925
Southern Colorado Power Company	Pueblo	Pueblo, Colo.	1	10,000	G.E.	1	7,500	G.E.	7,500	......	9,000 kva. West.	Completed, 1924
Pacific Gas and Electric Company	Sacramento (New Unit)	Sacramento, Calif.	1	17,000	G.E.	1	12,500	G.E.	17,500	17,500	7-3,333 kva. G.E.	Completed, July, 1924
Long Bell Lumber Company	Long Bell	Longview, Wash.	3	8,000	G.E.	3	6,000	G.E.	18,000	36,000	4-1,500 kva. G.E.* 13,860/2,200 volt	Completed, June, 1924
Grays Harbor Railway & Light Company	Electric Park	Aberdeen, Wash.	1	6,750	West.	1	5,000	West.	6,400	6,400	3-1,667 kva. G. E.	To be completed, 1925
Pacific Power & Light Company	Young's Bay	Astoria, Ore.	1	6,750	G.E.	1	5,000	G.E.	8,000	8,000	....	To be completed, 1925
Mountain States Power Company	North Bend	North Bend, Ore.	1	6,700	......	1	5,000	......	5,000	40,000	....	Completed, Dec., 1924
Roswell Public Service Company	Roswell (New Unit)	Roswell, N. M.	1	1,250	......	1	1,000	......	1,925	3,000	....	To be added, 1925
Utah Power & Light Company	Jordan (New Unit)	Salt Lake City, Utah	1	27,000	G. E.	1	20,000	G. E.	36,000	......	Not installed	Completed, 1924

Key to Abbreviations: A.-C., Allis-Chalmers Manufacturing Company; G.E., General Electric Company; West., Westinghouse Electric & Manufacturing Company.
*Station transformers only.

A Resume and a Forecast of Commercial Activity

To obtain an accurate summary of the commercial activities of the electric service companies of the West during 1924 and to secure an insight into what is planned for 1925, the Journal of Electricity requested statements from the heads of fourteen representative commercial departments. The information is consolidated in this article.

JUDGING from reports secured from the commercial departments of fourteen representative public utilities operating in the eleven Western states and British Columbia, it would be proper to state that the year 1924 had been one in which much had been done in the way of developing central station business. Taking the same source of information as a barometer for 1925, it must be conceded that even greater efforts will be made to develop the demand for energy from industrial, commercial and domestic consumers.

From Butte on the northeast to San Diego on the southwest, all of the companies have passed a year, which, despite the presidential election and various local disturbances, has witnessed the steady growth of load and revenue. The companies operating merchandising departments have placed current-consuming devices in homes which before had little or none of this modern equipment which means revenue to the central station and comfort to the consumer, and those utilities relying upon other channels of distribution have aided these retailers in many ways. The result has been that many electrical appliances have been placed on the lines during the year. Because of the fact that the number of residential consumers has increased so rapidly during the last five years the percentage of appliances in homes has receded rather than gained. To bring the percentage of appliances in the homes up to what it was five years ago and even higher will be one of the problems of the commercial department during the coming year.

While the use of electricity by industrial and commercial consumers has been increased remarkably during 1924, in the opinion of many there are great opportunities for the future. Commercial departments have been studying the field for new and greater uses of electricity, with the result that considerable increase in these two classes of load may be expected.

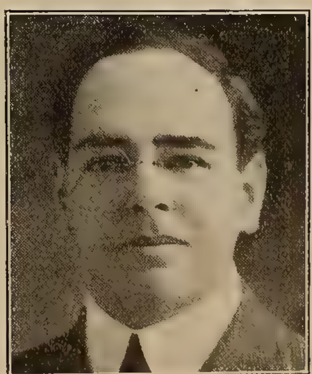
One of the principal problems confronting the commercial department is that of developing business of high load factor. Just as important is the improving of the load factor of present consumers. For these two reasons the seeking of off-peak business from all classes of customers may be confidently looked forward to.

What may be expected during the coming year by the Western central station companies has been summarized for the Journal of Electricity by W. R. Putnam, vice-president and general manager of the Idaho Power Company and chairman of the Commercial National Section of the National Electric Light Association. Mr. Putnam says:

"The gradual improvement in industrial conditions which has taken place throughout the country will require an increased use of electric service. The marked improvement in the price of metals, particularly copper, zinc and lead, resulting in increased production, affords the electric service companies supplying mining loads increased output. The lumber industry of the northern part of the section, and the fishing industry, particularly salmon, of the same section, are both looking forward to an unusually good year. The good fall of snow and rain in the mountains indicates excellent crop prospects for the year, and, while the wet season may reduce the use of electricity for irrigation pumping from the high figures of the dry year of 1924, the improved crop conditions will result in greater uses in other lines which should more than offset the loss in pumping use.

"In other words, our electric service utilities should have a very good year during 1925, with considerable increase in earnings over the past year.

W. R. PUTNAM



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LEWIS A. LEWIS

"The commercial departments presumably will generally be busy looking after the new business that will result from these good conditions, but, while separate figures at this time are not available for our Western utilities, the commercial men should profit by the figures shown in the editorial appearing in the January, 1925, N.E.L.A. Bulletin, which gives the following approximate results secured in our industry in 1924.

Per cent increase in total investment made during the year	18
Per cent increase in output for the year	6
Per cent increase in revenue for the year	5.3
Per cent increase in customers served	13

"These figures most clearly show two unfortunate happenings in our industry, first, investment growing faster than earnings, the primary cause for this being the higher costs of materials and labor used in our construction, and, second, a decreasing load factor on our systems.

"Naturally, with a business that is doubling in volume every seven years, our commercial departments have been busy taking care of the business offered and have paid too little attention to securing those types of business that are necessary to improve our load factor and thus offset the constantly increasing average unit cost of investment. Figures recently compiled show that in many instances the per capita expenses of our municipalities for street lighting are less now than ten years ago, while the per capita municipal expenditures as a whole are very materially increased. Due to the very rapid increase in residential customers supplied with service, it is now estimated that the homes which we serve are now only 18 per cent applianced, whereas five years ago it was estimated that they were 25 per cent applianced. These two illustrations point out the seriousness of the problem that confronts our commercial departments. The commercial men generally throughout the country are awakening to the realization of this condition and during 1925 will make a good start towards solving the problem."

Activities of commercial departments in the West have been diversified during the past year, according to the statements prepared for the Journal of Electricity and reproduced below. Plans for 1925 call for intensive effort in every locality.

Merchandise and Power Sales Engaged in by British Columbia Company

The British Columbia Electric Railway Company, Ltd., of Vancouver, as is shown in Table I, conducted eight appliance merchandising campaigns during 1924 on a schedule that was more frequent and intensive than in previous years, according to Edmund E. Walker, sales engineer. The company added 1,800 new residential consumers to its lines in Greater Vancouver and on Dec. 24, 1923, connected 6,000 hp. of demand from one power consumer.

Merchandising of electrical devices has been largely on a time-payment basis which Mr. Walker states is due to the fact that, "specialty store advertisers seem to have drifted into the department store groove and offer little in the advertisement but price, with the result that the purchaser has become educated to purchase on price and easy terms rather than on quality and service. To attract attention and make a success of a campaign we have had to follow the example set and feature easy down payments with longer periods in which to pay.

"New electrical merchandise such as a line of domestic refrigerators and a stock of radio products has been found satisfactory. We have installed an electric train and mechanical toy section with good results, particularly during the Christmas season when the merchandise attracted many persons.

TABLE I

BRITISH COLUMBIA ELECTRIC RAILWAY COMPANY, LIMITED.
STATEMENT SHOWING MERCHANDISE ACTIVITIES DURING 1924.

Date	Campaign Feature	Quota Set	Number Sold	No. of Extra Salesmen	Value of Merchandise	Broad-sides Mailed	News-paper Space	Terms: Cash Down	Terms: Balance Over	Special Wiring
March 3 to 31	Washers	200	208	4	$33,218.50	30,000	$ 580.00	$5.00	18 months	
April 7 to 28	Kitchen Unit	4000	3325	22	29,422.00	20,000	1306.14	15 day free trial, then 75c	10 "	Cost 90c for hanging
May 5 to June 14	Vacuum Cleaner	200	206	5	16,300.00	31,000	312.42	$1.00	15 "	
May 12 to June 30	Electric Ranges	150	47	None	6,000.00	16,000	136.40	9.75	18 "	Regular price
Aug. 8 to 16	Washers		6	None	840.00	None	123.00	5.00	14 "	
	Vacuum Cleaners		5	None	395.00	None		2.50	12 "	
	Electric Ranges		17	None	2,125.00	None		20.00	12 "	Special 10% discount given on range wiring
Sept. 1 to 15	Electric Ranges	60	24	None	3,266.65	1,000	297.57	10.00	16 "	$40.00 per range
Sept. 22 to Oct. 18	Washers	100	58	None	10,400.00	19,000	420.00	5.00	12 to 18 months	
Nov. 17 to Dec. 24	Vacuum Cleaners	138	132	4	10,428.00	18,000	250.00 Plus equal amount to manufacturer	2.50	15 months	

"In addition to our head office salesroom we have six branch offices where displays are made and sales consummated. These offices are supplemented by sixteen outside canvassing salesmen who operate in three groups selling ranges, washers or vacuum cleaners. We find that by getting the salesmen to specialize better results were secured than when the area of the city was divided into districts and each man sold all three types of articles.

"The company has only a few electric ranges connected to its lines within the city of Vancouver owing to the fact that it operates gas properties. The majority of the 1,500 electric ranges in service are located in the suburban area that is served."

In regard to the company's other efforts to increase the use of electricity Mr. Walker states, "Illumation has received careful attention during the year. An intensive canvass of stores and factories has been made to improve their illumination and has had gratifying results. Considerable development has taken place in suburban boulevard illumination, and advances in this direction are under way in the city area.

"Our most important power customer of the year has been the Britannia Mines, a copper producer reputed to be the largest in the British Empire, which was connected Dec. 24, 1923. The contract permits

a maximum demand of 6,000 hp. For this customer we had to extend from our North Vancouver substation 38 miles of 34,000-volt line. Harbor developments have proceeded apace and with three large grain elevators, together with pier facilities, the harbor commissioners have connected approximately 6,743 kva. to our lines. The Vancouver Terminal Grain Company's elevator with a 2,000-kva. load has been connected.

"To encourage the greater use of energy by domestic consumers we introduced a demand or floor area rate which is 5 cents per kw-hr. for the first 3 kw-hr. for each 100 sq.ft. of floor area with the excess at 2 cents per kw-hr. The minimum floor area allowed is 1,000 sq.ft., being equivalent to 30 kw-hr. We believe that this has helped to stimulate a freer use of electrical appliances.

"Prospects for 1925 are bright. There is considerable building activity in the city and suburban areas, the lumber industry looks forward to a busier year, and there is a movement in mining circles."

Washington Water Power Expands Sales Activity

In discussing the commercial activities of The Washington Water Power Company, Lewis A. Lewis, sales manager, makes the following statement:

"For the sales department of The Washington Water Power Company the year 1924 has been important, not so much because of increased business but rather because of an expansion in its field of activity, by virtue of which it will be able to meet the increased demand upon it as the business of the company grows.

"In the very important work connected with the sale of industrial power we feel that considerable progress has been made. Our industrial engineer and assistant have established contact with most of our industrial concerns in Spokane and vicinity. By familiarizing themselves with the operating conditions in these plants and by closely cooperating with the billing department, complaints regarding service and accounts have been decreased to a minimum. Studies have been made of some of the more important industries that are of interest in anticipating probable developments in the future. One of these investigations covered the lumber industry of Spokane and the Inland Empire, and in order that our viewpoint might be broadened our industrial engineer visited a number of the important lumber districts of Oregon where central stations had developed important loads in that industry. A survey was then made of the business available in our own territory with the following results:

Lumber Mills Using Steam Power

	No. of Plants	Connected Load—hp.	Output FBM 1 Shift
On or near W.W.P. lines	8	4,225	510,000
On or near other lines	9	3,725	450,000
10 to 30 miles from any line	6	2,600	360,000
Total	23	10,550	1,320,000

Mills Partially Electrified—Making Their Own Power

No. of Plants	Connected Load—hp.	Output FBM 1 Shift	Gen. Cap.—hp.
4	4,900	340,000	3,350
2	1,650	150,000	870
5	6,750	790,000	4,700
11	13,300	1,280,000	8,920

"In Spokane our company serves about 75 per cent of the woodworking plants, and during the last six months one of the local sawmills which produces most of its power has installed one large motor and may install several more. This shows the tendency that exists among progressive operators to depend upon central station service where it is available. The principal questions are whether it is worth while to build long transmission lines to serve remote plants, and whether special class rates should be made to develop this load.

"During the past three years the growth of our general transmission system has enabled us to develop an important irrigation load, particularly in Grant County and Chelan County. In these localities the increase in electric pumping has been substantial. We also have important irrigation loads in Okanogan and Spokane Counties. The total area in the four counties mentioned, irrigated by electric pumping, is 28,800 acres, and the load amounts to 9,000 hp. or about 1/3 hp. per acre. We expect this load to grow. In Grant County, for example, there are only 4,000 acres under pumps, whereas our lines are able to serve 25,000 acres. In Chelan County the present area of 5,000 acres will eventually be doubled.

"Early in 1924 we established a department of illuminating engineering under the direction of an illuminating engineer who has established contact with architects, electrical contractor-dealers, and many of our important merchants. He was one of the most active members of the committee which conducted the Home Lighting Contest for the National Electric Light Association, and in addition he has given a number of talks on lighting before various trade associations and civic bodies.

"We feel that domestic refrigerating machines offer great possibilties for the future, and last summer we engaged a sales engineer who has devoted all his time to selling the domestic plants which we handle. Besides thoroughly canvassing the field, he has interviewed all of the users and has made it a point to see that adequate service is given. Out of a total of 150 domestic refrigerators now in service in Spokane, 34 have been installed by our company during the past year. We selected a list of prominent business men, and to these we offered six months free trial of a suitable machine. A small refrigerator with self-contained electric unit has now been perfected, and we expect to sell quite a number of these to apartment houses.

"During 1924 to a special representative of this department there was assigned the task of supervising the accounts of our important mining customers in the Coeur d'Alene district of northern Idaho, and also of public utilities in this territory to which we sell power wholesale. This representative has established contact with such customers and has been the means of securing some important improvements in our service facilities. Due to the high prices of lead and zinc, the mining activities in 1924 showed a large increase over those for 1923, and our revenues increased in proportion.

"In merchandising, our business for 1924 was very satisfactory indeed, although because of general conditions in the territory the volume was below that

of 1923. We consider general conditions now are favorable and anticipate a good year. During 1924 two special campaigns were conducted in the sale of electric ranges that resulted in the sale of 715 during a total period of 12 weeks. Of these approximately 60 per cent were sold in Spokane, and the balance in the 56 towns of the Inland Empire served directly by our company. Campaigns were also conducted in the sale of electric irons, air heaters, washing machines, and vacuum cleaners, each one of which was very successful.

"The results for the year were as follows for Spokane and the country towns:

Electric ranges	890	Air heaters	835
Water heaters	889	Waffle irons	558
Vacuum cleaners	620	Curling irons	436
Washing machines	548	Toasters	195
Electric irons	972	Percolators	184
Heating pads	183	Foot logs	162
Grills	158	Hot plates	148
Miscellaneous	337		

Total number of appliances sold	7,115
Total sales value	$385,792
Total number residential consumers	32,200
Sales per consumer	$11.98
Total number of electric ranges and water heaters now in service on our lines is approximately	6,000

"Our plans for 1925 provide for special campaigns on kitchen lighting units, electric ranges and water heaters, small domestic ironers, washers, electric irons, air heaters, and waffle irons. With mining and lumbering conditions as favorable as they are, and with good agricultural conditions, provided the latter are realized as the year advances, our merchandising should be successful this year, and better than for 1924."

Portland Electric Power Company Was Active Range Merchandiser

Merchandising of electric ranges was the principal activity entered into during 1924 to increase the domestic demands for electricity on the lines of the Portland Electric Power Company, states A. C. McMicken, sales manager. Touching on this matter further, Mr. McMicken explains:


A. C. McMICKEN

"To promote the use of electric ranges in the home three campaigns of a month to five weeks duration each were conducted. The dates of these sales drives and the number of ranges sold during each were as follows:

March 24 to April 23	316
Sept. 22 to Oct. 31	341
May 26 to June 30	292
Total	949

"The result of the three campaigns was somewhat less than was expected. This may be ascribed to the adverse effect of the depression in the lumber business and allied industries in and around Portland, which commenced early in May and continued throughout practically the entire year. Besides the sales made during these campaigns, 862 additional ranges were sold during the rest of the year, making a total for the year of 1,811 ranges sold.

"The company was actively engaged in the sale of all other electrical appliances through its electric stores in Portland and other cities which it serves, although no special campaign effort was directed toward the sale of any appliance other than ranges. The gross merchandise sales for the year amounted to $406,041.19, which, compared with 1923, was an increase of 18.7 per cent. During 1924, a year in which Portland's residential building operations exceeded those of any year of its history, the company likewise enjoyed its largest increase in residential and apartment house business. The gain in customers in all classes of service amounted to 6,817.

"During the current year the company plans again to conduct three range campaigns. These will be of short duration and will occur two in the spring and one in the fall. In addition, this year, the company expects to solicit its customers on a kitchen lighting unit. This will be done through a series of district campaigns, in which the city of Portland and the outlying towns served by the company will be divided into districts and each district worked in turn, so that by the end of the year the entire territory will have been covered. Plans for this series of campaigns are taking shape at the present time, and the first campaign will commence in February."

Annual Appliance Campaigns Important to Pacific Power & Light Company

In reviewing the commercial activities of the Pacific Power & Light Company, which serves a large territory in Oregon and Washington and maintains district offices in fifteen cities, V. H. Moon, appliance sales superintendent, states:


V. H. MOON

"During 1924 the Pacific Power & Light Company engaged in the three major appliance campaigns which have become annual events with this company, namely, vacuum cleaners in the spring, ranges in the summer and washing machines in the fall. In addition, last year the company conducted a kitchen lighting campaign in the early spring. The results of these campaigns, with the additional sales made throughout the rest of the year, were as follows:

	Campaign Sales	Sales Rest of Year	Total Sales for Year
Feb. 1 to Mar. 15, kitchen lighting units	1,985	.....	.....
April 1 to May 1, vacuum cleaners	258	152	410
May 15 to July 1, ranges	162	95	257
Sept. 15 to Oct. 15, washing machines	356	215	571

"It should be noted that gas is sold by the company in a number of districts, and this fact has a distinct bearing on the sale of electric ranges since only about one-third of the company's residential territory is open to the unrestricted sale of these appliances.

"In addition to these so-called major campaigns, several smaller and less intensive campaigns were conducted on irons, toaster-stoves, percolators, toasters and the small-sized, gas-heated, electrically driven ironers. Electric merchandise sales for the

year averaged about $8 per customer over the entire territory.

"In 1925 the company's merchandising activities will follow practically the same course as they did last year. A kitchen lighting campaign is at present in progress; during two weeks in March a washing machine campaign is contemplated, which will be the main point of difference between this year's and last year's activities; vacuum cleaners will be featured in April; ranges will be campaigned from May to July; washing machines again in September and October. It is possible also that special effort will be applied to the sale of electrically heated ironers, electric home refrigerators and, in rural territory, motor-driven domestic water systems."

Number of Meters Increased 13 Per Cent on San Diego System

The rapid growth of San Diego that continued during 1924, was reflected by a gain in the number of consumers receiving electricity from the San Diego Consolidated Gas & Electric Company, according to A. E. Holloway, superintendent of the commercial department. The number of meters in service increased 13 per cent during the year just ended. The increase in load on the company's system came not only as a result of the growth of the city but partly because of the efforts of the commercial department, which have been summarized by Mr. Holloway as follows:


A. E. HOLLOWAY

"A campaign was conducted to increase the street lighting by the installation of ornamental posts with 400-cp. and 600-cp. lamps. The number of ornamental standards installed during the year was over 50 per cent of the total in service to Jan. 1, 1924. Better window lighting has been installed in a large number of stores, and the sign load is being continually increased.

"The few isolated plants are being gradually reduced by changing them over to central-station service. There is a very small field for future activity along this line because nearly all those who were operating their own plants are now purchasing power from our company.

"Many completely electrified homes were built during the year. Each one of these proved to be a good advertisement as other people were sold the idea so that 'electrically throughout' is gaining popularity. A special effort was made to increase the electric-range and water-heater load. This has increased 51 per cent over the corresponding period a year previous.

"During 1925 it is expected that the business of the company will continue to expand in order to take care of the steady growth of the community which it serves. During the early part of the year the company purposes to put on a kitchen lighting campaign, patterning the drive after the methods followed by other central stations which have been so successful. It is thought that increasing the standard of illumination in the kitchen will result in bettering lighting conditions throughout the home. An effort will also be made to install the kitchen-lighting type of units in the small stores.

"It is proposed to build and open for inspection another electric home in conjunction with the California Electrical Cooperative Campaign. It is planned to make this home as successful as San Diego's first electric home, which was visited by over twenty thousand people.

"To further the sale of the larger current-consuming devices, a display room is being fitted up for the demonstration of industrial gas and electric heating and cooking appliances. Not only will domestic ranges, water and air heaters be on display, but it is proposed to show a line of heavy duty ranges and commercial cooking appliances.

"The advertising and educational campaign being carried on is bearing fruit. Customers are beginning to give more attention to adequate wiring and correct illumination in their homes. The company looks forward to the coming year with confidence."

Southern Sierras Made Steady Drive for Business

Although no special efforts to increase the use of energy were made by The Southern Sierras Power Company of Riverside, Calif. George T. Bigelow, commercial manager, makes the statement that there has been a steady growth recorded by the company. The shortage of power in southern California was responsible for the fact that no specific sales campaigns were conducted by the company during 1924. According to Mr. Bigelow: "Commercial activity has been limited to a steady drive for residential and commercial load within the territory served by the company. This effort has been productive and the load shows a good gain over last year. Merchandise sales have tripled in the last two years, and intensive work on electric ranges has brought the saturation up to one range to each ten lighting consumers."


GEORGE T. BIGELOW

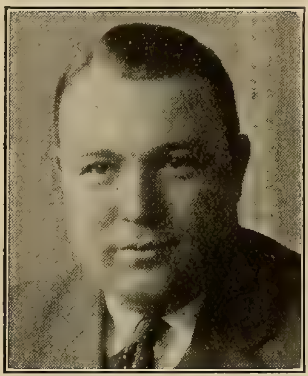
Montana Power Company Active During 1924

"The Montana Power Company, operating in seventy-four cities and towns of Montana, had a busy year of commercial activities," reports J. Ryan Gaul, manager of the Butte district. "Despite the fact that the state is just emerging from an industrial and agricultural crisis, this company has just completed one of its most active years.

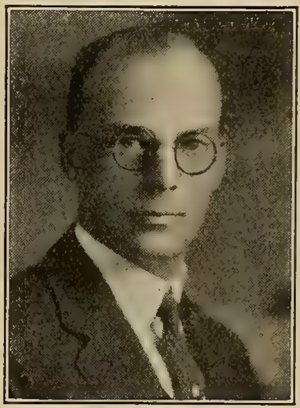
"The campaign to place a substantial block of the common stock with the people of the state resulted successfully. The securities were offered in small share lots, on an easy payment plan, through a sales organization composed of every employee of the company. The volume of sales speaks most highly

for the people's confidence not only in the company but also in the future of the state. The far-sighted wisdom of placing the company's stock with the public has been amply proved. A very marked interest in its affairs on the part of the public has been noted.

"The new domestic rate in effect only a year and a half has been conducive to the greater use of electrical appliances in the home. Lamp-socket devices were sold in volume. In this regard it will be interesting to note that flat irons, portable heaters, waffle irons, washers and vacuum cleaners were the most popular appliances in this division. Approximately 1,000 additional ranges were sold and installed on the system during the year. Considerable missionary work was done during the last twelve months on water heaters and domestic ironers. Many new heavy-duty installations were also made, and the company points with pride to the number of hotels, restaurants, bakeries, hospitals and other institutions now equipped either wholly or in part with electric equipment.



G. B. BUCK



W. M. SHEPARD

A. M. FROST

"The new year opens in Montana under most auspicious circumstances. The tenseness in the agricultural regions has been relieved by the production in 1924 of the largest crop in the state's history, for which record prices were secured. As a consequence the farmer is liquidating his debts in splendid manner. In the mining sections, high hopes are entertained for the future. Lead and zinc prices are strong, while copper is once more coming into its own as the King of Metals.

"With three of the state's largest cities, Butte, Great Falls and Anaconda, in which the Montana Power Company operates, almost entirely dependent on the condition of the mining industry and with the balance of the state most vitally affected by same, it is a source of relief to company officials to see the metal industry now emerge from the chaotic conditions of the post-war period. These favorable economic conditions, coupled with the fact that a constructive regime administers state government, prompt this company to expect much of the future."

Public Service Company of Colorado Shows 32.7 Per Cent Gross Sales Increase

The year 1924 was one of the best years in the commercial history of the Public Service Company of Colorado, in the opinion of G. B. Buck, manager of the commercial electric department. During the year the company carried out a well planned sales campaign, and Mr. Buck is of the opinion that careful planning of these campaigns is essential. In reviewing the activities of the commercial electric department of his company, which increased gross sales 32.7 per cent during the past year, Mr. Buck states:

"Realizing the importance of campaign activities to the production of increased revenue, this department conducted a kitchen unit campaign in which 7,719 sales were made to 9.3 per cent of the customers served; a washing machine campaign in which 400 machines were sold in 30 days; and a 30-day sales drive on vacuum cleaners which resulted in placing 350 cleaners in the homes of consumers. In the kitchen unit campaign the western division of the company established what we believe to be a world record as the total sales in this division amounted to 34 per cent of the customers served.

"Through wiring and fixture campaigns, this department added considerably to the number of customers receiving service. The net increase in customers of 1924 over 1923 was 11 per cent.

"In addition to the foregoing campaigns this department, under C. A. Semrad, commercial manager, took active part in successfully carrying on the Home Lighting Contest.

"The entire electrical industry in Denver has been assisted materially during the past year by the Electrical Cooperative League of Denver. During December the league was very active in staging a decorative lighting contest, appropriate for Christmas. Hundreds of our customers participated in this contest, and prizes for the best decorations were awarded by the league. This activity was a great revenue stimulator.

"The Public Service Company of Colorado is looking forward to a year of increased business for 1925, and toward that end many changes in personnel and organization are contemplated. Budgets show expected increased results from all departments. This is particularly so in the sign and display lighting department which has been budgeted to produce an increase of 100 per cent in signs sold and a 50 per cent increase in gross sales.

"Lamp sales are also expected to show marked improvement; at least a 50 per cent increase in gross sales, with decidedly increased wattage is fore-

cast. A liberal use of colored lamps is scheduled for the coming year.

"Appliance merchandising campaigns have been planned for the entire year, and the addition of many new lines is contemplated. A radio department is planned in addition to a refrigeration department which is already in operation. Improved customers' service is on the schedule, and is virtually assured by the installation of a customers' service shop which is now functioning very satisfactorily.

"More intensive work on the sale of fixtures is planned by the inauguration of a fixture department equipped and capable of giving valuable assistance to the customer in helping to choose the proper kind of fixture to harmonize with other furnishings and color scheme.

"Generally speaking, the 1925 sales program of this department will be based on broad general lines, endeavoring to fulfill the three fundamentals of such a department, namely: (1.) the production of increased gross revenue; (2.) the production of increased gross sales merchandising; and (3.) the improvement of public relations."

San Joaquin Company Gains 40,000 kw. in Load

Over 40,000 kw. of various classes of load have been connected to the lines of the San Joaquin Light & Power Corporation during 1924, according to A. M. Frost, manager of sales, who reviews the year's commercial activities as follows:

"The following tabulation shows the number of consumers added under various classifications of service, and the connected load in horsepower and kilowatts.

Schedule	Consumers	Connected Load
Lighting	4,232	5,100 kw.
Cooking	656	6,135 kw.
Industrial power	433	17,342 hp.
Agritultural power	1,926	22,385 hp.

"We have taken up a good many activities of a general business-building character that have shown no immediate result in business added to our lines. These intangible activities, however, have an indirect bearing on our load development, and in some cases in the past, and in a good many cases in the future, we feel we will be able to trace additional business to them.

"As an example, we have pursued the promotion of cotton planting and cotton-processing plants throughout the territory, working with the Chambers of Commerce, growers' organizations, department of agriculture specialists, and real estate operators. Cotton has come to the San Joaquin Valley, and will be an important factor in its future development. We do not know just how much business has been added for us as a result of our activities in the promotion of this cotton industry, but we do know definitely that cotton brought back into operation over 1,000 hp. in plants that had been connected to our lines and had been out of operation from one to five years.

"We know there are now twelve cotton gins operating on our lines, six of them having been added during the year 1924. We also know that there are two cottonseed-oil mills operating on our lines, one of them added during 1924. This latter mill is returning us an earning of approximately $1,000 per month, and will operate approximately ten months a year. A recent survey of their activities shows them to be in a sound financial condition, with many reasons to expect continued success in their operation.

"A survey made some months ago of the acreage in cotton, and the consequent use of power for its irrigation, as well as the operation of processing machinery, has returned us, during 1924, approximately $175,000 in gross earnings.

"The cotton acreage in the San Joaquin Valley in 1923 was 10,000 acres; in 1924, 35,000 acres and in 1925 promises to nearly double the latter amount. The average production will run above three-quarters of a bale to the acre and in some cases as high as two bales per acre has been produced. With cotton values of approximately 24 cents per lb. it can be seen that this is a valuable agricultural asset to the San Joaquin Valley.

"We have had representatives of the sales department contacting with farm bureaus and representatives of the agricultural departments, both state and federal, as well as the Agricultural College of the University of California, for the purpose of securing information on up-to-date methods of agriculture, and also for the purpose of acquainting the representatives of these different bureaus with the value of our service to agriculture generally.

"The promotion of the idea of winter irrigation, for the building up of our winter load and the increasing of earnings on existing facilities, is also recognized by many agricultural authorities as highly valuable to the farmers of our territory. Information on this subject has been spread through general publicity and also through the medium of personal contact and the mailing of bulletins directly to our agricultural consumers.

"This department has also conducted a pump-testing service for the benefit of our agricultural power consumers. These tests determine the efficiency of a consumer's pumping plant. A report is made to him which will enable him to make repairs, where needed, for the increasing of the efficiency of his equipment, with the resultant increase in amount of water, and better irrigation service for the dollars that he is spending with us for electric power.

"We conducted 185 of these tests during 1924 and worked out rather elaborate reports on the cost per acre-foot under varying heads and load factor conditions in different parts of our territory. These reports have been very valuable in giving us information on actual cost to the consumer and have been valuable to the consumer for the same purpose, and have given our consumers in a great many cases an understanding of the better value and more reasonable cost of electric power service in irrigation.

"A survey was made of the oil fields in 1924 to determine the extent to which our service is used and for soliciting new business. This survey has proved very valuable; something over 5,000 hp. in oil fields was added during 1924.

"The Home Lighting Contest in our territory was very successful and has brought about a general

consciousness on the part of lighting consumers as to the value of lighting service and possible increased value by the proper application of that service through the use of modern lighting units.

"This department also conducted the development of business on our extension built in the Santa Ynez territory, from Lompoc to Santa Ynez, approximately 25 miles. Forty-four agricultural power consumers were added, totaling 811.5 hp. Sixteen industrial consumers, totaling 149 hp., as well as 222 lighting consumers, totaling 312 kw. were also added.

"The engineer in charge of this work for us assisted our prospective consumers in laying out their irrigation systems, advising with them on the type and size of installations to make and advising with pump and apparatus people on these installations, for the benefit of our consumers. The result of this work was highly satisfactory to all parties. Several months were spent on the job, and we feel that this work was a definite achievement, inasmuch as this territory had never been served with electric service before and the residents in the territory were absolutely unfamiliar with dealing with power companies. Relations with these consumers were so satisfactorily established, and such exact care was used in advising them, that out of all the consumers served we have had no complaint as to unsatisfactory service or high bills.

"We have introduced electric heating service into one cannery for the purpose of processing figs. Reports at the end of this season from the cannery operators show that they are more than satisfied with the cost of operation, and definitely state that electric heat has produced for them a very superior pack. A new cannery to be built on our lines in 1925 will be completely equipped with electric heating units.

"We have also applied our heating service in the sweat rooms of a number of orange packing houses, and recent reports indicate that the service is far superior to other methods previously used and that its cost is less than the cost of operation with other types of fuel."

California Oregon Reports Prosperous Year

A prosperous year has just been closed by The California Oregon Power Company, according to W. M. Shepard, vice-president and general agent of the Medford, Ore., utility, who states that, "the increase in connected load during the year has amounted to 9,164 kw. Included in this is an increase of 4,800 hp. in connected motor load and an increase of 4,367 kw. in domestic and lighting load. The total number of electric consumers has increased from 13,395 to 14,687.

"In the Umpqua division the demand on the Roseburg substation increased from 696 kw. in June, 1924, to 1,080 kw. in December, 1924, and the output per month from 322,800 kw-hr. in May to 445,200 kw-hr. in December.

"Over 330 electric ranges were added to the company's lines during the year, bringing the total number up to 1,687. In order to stimulate the sale of electric ranges, cooking schools were put on during the past summer in Medford, Klamath Falls, Grants Pass and Roseburg, with cooking demonstrations at Yreka and Dunsmuir. These activities increased the interest in electric ranges and stimulated electric range sales.

"During the year the Home Lighting Contest was put on in the territory served by the company in 37 towns having 93 schools. The total number of eligible pupils was 7,947 and the total number of pupils entering the contest was 3,155.

"The outlook for business growth for the year 1925 is most encouraging. The company has contracted already for a very considerable additional load, which has not as yet been connected, and all indications point to a rate of growth during the year 1925 equaling or exceeding that of 1924."

Extensive 1925 Sales Program Outlined by P.G.& E.

An aggressive, creative sales program is planned for 1925 by the Pacific Gas and Electric Company, which now serves over 376,000 electric consumers in California, says H. M. Crawford, sales manager, who continues:

"With Pit 3 hydroelectric plant making available an additional 100,000 hp., and approximately 40,000 hp. more from The California Oregon Power Company, there will be available a block of power which will permit of an active selling campaign.

"With a widely scattered territory covering thirty-eight counties in California and extending from Redding in the north to Fresno in the south, it is necessary to have an active selling force supervised by a new business superintendent in each one of the twelve important geographic divisions into which the territory is divided. These are in turn guided by the head office organization of highly trained specialists in their respective lines of endeavor. In this organization, the Pacific Gas and Electric Company has followed the tendency in most large sales organizations of the country in decentralizing immediate control and centralizing policy management.

"The responsibilities of this management when affecting electric sales are placed by the sales department on H. E. Sandoval, who has under his direction sales engineers grouped approximately in four divisions—illumination, power sales, industrial heating and electric transportation, and appliance sales.

"The work of the illumination division in 1925 will cover all lighting problems, including general domestic and commercial lighting; sign, industrial, and exterior lighting; and particular attention will be given to street lighting on account of the public relations involved. A special study of proper lamp voltage in the sale of lamps on our system will be made, as the proper supervision and guidance of lamp sales has a most important bearing on revenue.

"Power sales work has required, and will continue to require, the time of a highly specialized sales engineer. He will cover the application of electric power in industrial and agricultural installations with particular attention to isolated plants, both from a standpoint of preventing such installations, and of making detailed analyses of existing installations with a view to convincing the operators that central station service would be preferable. A recent

survey shows that there is approximately 25,000 hp. in existing isolated plants operating within the reach of the Pacific Gas and Electric Company which represent an estimated annual revenue of nearly $400,000.

"Both industrial heating and electric transportation offer big fields for the central station, and very satisfactory results have been obtained so far from our efforts, which will be continued and stressed in 1925. Industrial heating offers an opportunity for high power factor, high load factor business and is many times operated off-peak. As an illustration of this load, we have a 2,000-kw. melting furnace at the Best Steel Casting Company, producing a revenue of $32,000 per year. The Southern Pacific Company at Sacramento also operates a 2,000-kw. furnace, and the Market Street Railway Company operates a 60-kw. brass melting furnace using 100,000 kw-hr. per year. On these loads the investments on facilities to serve are reasonable, and the revenue derived often equals several hundred residential consumers. Excellent surveys have been made of future loads with like possibilities.

H. M. CRAWFORD

F. H. WOODWARD

A. W. CHILDS

"Electric transportation has been stressed by the Pacific Gas and Electric Company for some years past, and a special engineer has been kept actively on this work, in cooperation with truck selling agencies. This combined effort has strengthened the electric truck proposition materially with the public. This type of business offers a big field for high revenue, off-peak, load, and a conspicuous installation made recently is the American Railway Express Company in Oakland, consisting of thirteen trucks with an estimated annual revenue of about $1,800. Also, twelve trucks for the California Baking Company in San Francisco with a yearly revenue of $1,692, and ten trucks for the National Ice Cream Company with a yearly revenue of $1,164. The Remar Baking Company of Oakland has also found the electric truck admirably adapted to delivering bread and is now using eighteen trucks. The Capitol Dairy has also found it ideal for its work and is employing eight trucks. This is merely the beginning and, considering the number of concerns of a similar nature that are prospective purchasers, it is certain that the next year will see a marked increase in this economic method of transportation.

"Although the Pacific Gas and Electric Company does not merchandise lamp-socket devices, considerable time has been spent on selling electric ranges and water heaters. As a result there are today on the lines of the company 5,800 electric ranges and 2,700 electric water heaters. These produce an annual revenue of nearly $400,000. This line of endeavor, which has been pioneered for some years by this company, will be continued actively, and a larger increased sale is confidently anticipated. Commercial cooking and heating also offer an opportunity for high revenue business, and electric bake ovens of from 15 to 50 kw. are numerous on our lines. Domestic refrigeration is of great interest to any central station sales department on account of the fact that it has a very high revenue per kilowatt of demand. In this territory last year, about 500 machines of all makes were sold. Plans are now being made to extend the agencies, and in 1925 these figures no doubt will be exceeded materially.

"Shipping and bank clearances are increasing in this district at a very rapid rate. Building has been growing at a rate very much greater than in previous years, and indications are that it will continue so to increase. The continued strength in prices of general farm products has been of particular significance, and assures the farmer receiving a large part of the increased value of his crops.

"Water conditions in California are always an important factor, and it is interesting today to note that in this territory the precipitation, including snow-melt up to the middle of January, 1925, is 80 per cent of the normal; one month ago in December it was 105 per cent. While January is certain to be a sub-normal month as regards precipitation, we are hopeful that the months following will bring this total up to at least a normal season.

"The general economic and weather conditions indicate a most favorable outlook for this territory in 1925, and it is our confident expectation that a large volume of electric sales will result."

Great Western Reports Rapid Growth

The year just past has been particularly gratifying to the sales department of the Great Western Power Company of California, announces F. H. Woodward, general sales manager. Continuing, Mr. Woodward reports:

"The growth of business has been rapid, and the number of new customers signed up satisfactory. The increase in population of that portion of Cali-

fornia served by the Great Western company has resulted in bringing new industries and in increasing the size of those already here. Many new office buildings and residences also have been constructed. The most impressive heating installation was a 1,000-kw. electric furnace for melting scrap metal.

"An idea of the increased business secured during 1924 may be gained from the following:

Increase In Business In 1924 Over 1923

Increase in number of lighting consumers	11½ per cent
Increase in number of power consumers	15½ "
Increase in revenue from lighting consumers	12¼ "
Increase in revenue from power consumers	7¾ "
Increase in kw. connected—lighting	13½ "
Increase in kw. connected—power	13¾ "
Incraese in number of ranges connected to lines	35 "
Increase in number of water heaters connected to lines	21 "
Increase in number of air heaters connected to lines	47 "
Increase in heavy duty cooking equipment	77 "

"Plans for 1925 include extensive additions to substations and distribution facilities that will be made during the year to prepare for rapidly growing demand in all territory served by the company. Preparations will be made for the ultimate raising of the Big Meadows Dam 45 ft., which will increase the storage capacity of Lake Almanor to approximately 1,300,000 acre-feet. The completion of the new dam will give the Great Western storage capacity greater than the combined capacities of all the power and water companies of the state.

"The San Francisco division is to have a new office building. It will be modern in all respects, have a model electric kitchen, suitable display space for appliances, and will be heated throughout by electricity.

"Additional attention will be given to illuminating engineering and special service will be placed at the disposal of archiects, builders and the general public to assist in solving lighting problems. One of the greatest activities will be in the appliance department. Endeavor will be made to add to the number of electric ranges, water and air heaters now on the Great Western Power system. Exhaustive study has been made of the value of this load to the company, with the result that every effort will be made to increase it.

"The growth of air heating has been particularly gratifying, especially in San Francisco where this is an all year-round load, while in the interior it supplements the summer irrigation load and rounds out the annual demand, doing away to a large extent with the winter 'valley' on the annual load curve.

"The demand for the all-electric home is rapidly growing. There are at the present time many of these in course of construction and more under consideration. These homes will be electrical in every respect. No other fuel will be used, and beyond a possible fireplace largely for ornamental purposes in the living room there will not be even a chimney on many of these houses. Not only are the home-owners showing interest, but some of the building companies that erect large tracts of homes for sale find that the demand for all-electric homes is such that they are now considering building them in advance of the sale."

Puget Sound Looks for Successful Year

Although no definite plans for commercial activity for 1925 have been announced by the Puget Sound Power & Light Company, R. W. Clark, assistant sales manager, believes that "conditions are very favorable for working out the coming year's commercial program."

Edison Company Seeks Additional Load

In common with many other large central stations, the Southern California Edison Company's commercial department will concentrate its energies in 1925 on developing additional load, reports A. W. Childs, general sales manager. In discussing merchandising activities of his company Mr. Childs states:

"About Dec. 1, 1924, the Edison company launched a kitchen lighting unit campaign starting in its Vernon district to test sales methods and to train salesmen. In this district 14,000 customers were visited in a house-to-house canvass and 1,490 units were sold. The proposition in Vernon covered a complete kitchen lighting unit with 100-watt Mazda lamps, the price being $6.75.

"The customer was invited to use the light for thirty days, and no initial payment was required. At the end of the thirty-day period, if the customer did not notify the company that the light was not wanted, it was taken for granted that the new unit was satisfactory and a bill for 75 cents was sent with the next lighting bill, to be followed with bills for 75 cents each month until the entire amount has been paid. At the time sale was made no lower price for cash was mentioned, but when the first bill was sent out it was accompanied by a notice stating that $6 would be accepted as full cash payment, a saving of 75 cents.

"From the experience of the test campaign several interesting points developed. In the first place it was discovered that many of the kitchens did not have wall switches, and that the pendant fixture was used also as a connection for the electric iron, with the result that when the ceiling light was installed the iron outlet was gone. We also found that the thirty-day free trial period was longer than necessary and that the salesmen can finish their work and get on to another territory if this is reduced.

"Profiting by the experience gained in the test campaign, a modified plan was adopted and is being used in several districts. Under this plan a pendant attachment, consisting of a switch and convenience outlet, has been added to the unit. This sells for $7.95 with an initial payment of 95 cents and $1 per month. The free-trial period has been reduced to fifteen days. Thirty-five salesmen are selling 350 units per day. Installation is being made by local contractors, the cost to the company being 75 cents per unit.

"The present plan calls for the kitchen lighting unit campaign to terminate about the first of May and to be renewed next fall. In the meantime the present sales force will be used in an energetic campaign for the sale of appliances including percolators, waffle irons, toasters, irons and other similar house-

hold labor-saving devices. Sales displays will be maintained in all company offices, and office employees will receive a commission on sales made.

"In addition to efforts made to increase the lighting load through the sale of kitchen lighting units, sales activities will be directed toward commercial lighting for all classes, including window and store lighting, signs, flood lighting, ornamental street lighting, and toward small domestic motors for pumps and feed cutting. Sales methods through personal solicitation by salesmen will be augmented by advertising and direct-mail appeals, and special campaigns will be put on from time to time featuring a current-consuming device either for heating, cooking or lighting.

"With sufficient power available for the requirements of the coming year, all applications for lighting and power service are being taken care of, and it is the purpose of the company to go after saturation business aggressively and make special efforts to secure higher-rate business. Electric-range and water-heater sales will be promoted through advertising, soliciting and demonstrating. Special efforts will be made to sell water heaters to all existing range users. Bake opens also will receive attention."

From the foregoing remarks of these fifteen men, who are leaders in the commercial activities of the West, it can be seen that throughout 1925 extensive efforts will be put forward by every electric-service company to increase the demand for electricity. The plans that have been made speak well for the growth of the West, and when it is considered that the construction programs of these companies are being kept well in front of the demands for service, the West may well congratulate itself upon the foresight and capable management of its public utilities.

Next Five Years Promise Record Growth for the Industry

PHENOMENAL is the word which best describes the growth of the light and power industry of the eleven Western states during the past fifteen years; and phenomenal is the only word which will describe the growth which past performance indicates will take place during the five-year period to come. Prior to 1910 the industry was relatively unimportant as compared with the other industries of the section—agriculture, stock raising, lumbering and mining—but during the succeeding fifteen years it has risen to a point where it merits the term, "basic industry," which is now applied to it.

In attempting to picture just what this growth has been and what it will be for the next five years, four factors have been considered, namely, installed generator capacity, kilowatt-hour output, number of consumers and connected load. Fig. I shows the growth in connected load for the eleven Western states. Starting in 1910 with 1,245,000 kw. connected to the lines of the electric service companies, the growth has been such that on Jan. 1, 1925, the utilities were serving a connected load of 6,310,000 kw., an increase during the fifteen-year period of more than 500 per cent. Projecting this curve into the future shows that in 1930 the utilities will be serving a connected load of approximately 9,780,000 kw. This is an increase of 55 per cent, the same figure that held during the period 1920-1925.

The importance of the industry in California, where it has reached a stage of development not equaled by any other state in the Union, is shown in Fig. II. In fifteen years the connected load in California has grown from 625,000 kw. to 3,320,000 kw., and a conservative estimate for 1930 is 5,200,000 kw.

The manner in which the total load is divided among various classes is shown in Table I, which gives an accurate idea of the relative importance of the different classifications in each section of the West. In California the industrial, domestic and commercial lighting and agricultural load are the most important. The lighting and industrial loads lead in the Pacific Northwest, but in the Intermountain states lighting takes first place, mining second and industrial load third.

The installed generator capacity necessary to serve this load is shown in Fig. III, which depicts the growth from 1910 up to 1930. In the fifteen-year period of 1910-1925 the growth has been 283 per cent, while during the next five-year period it is estimated that the installed capacity will increase slightly less than 55 per cent. The installed capacity may be expected by 1930 to reach a total of

Table I—Classification of Connected Load, Eleven Western States, Jan. 1, 1925

	California and Nevada		Pacific Northwest		Intermountain		Total	
	Kw.	Per Cent	Kw.	Per Cent	Kw.	Per Cent	Kw.	Per Cent
Domestic and Commercial Lighting	1,179,222	34.8	697,000	42.2	436,000	34.3	2,312,222	49.6
Agricultural	422,006	12.5	67,400	4.1	40,700	3.2	530,106	8.4
Railroad	214,526	6.3	160,900	9.7	101,500	8.0	476,926	7.6
Mining	89,612	2.6	54,100	3.3	395,000	31.1	538,712	8.5
Industrial	1,229,706	36.3	443,000	26.8	232,200	18.3	1,904,906	30.2
Miscellaneous	253,546	7.5	229,500	13.9	64,800	5.1	547,846	8.7
Totals	3,388,618		1,651,900		1,270,200		6,310,718	
Per Cent	53.7		26.2		20.1		100.0	

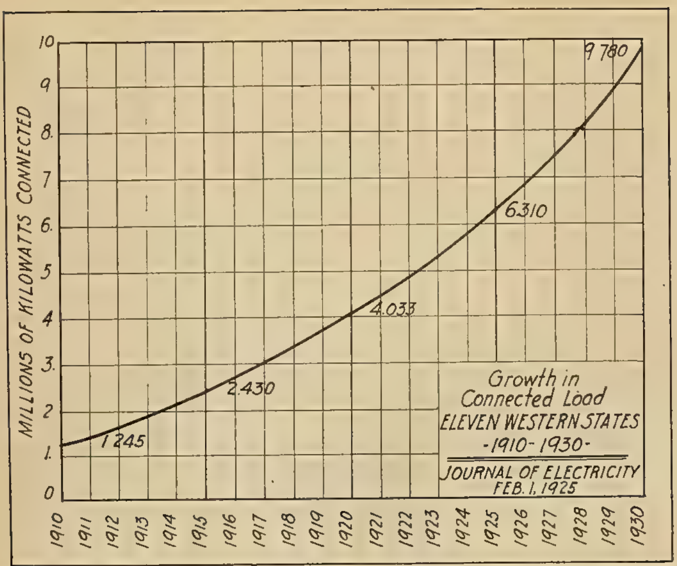


Fig. 1.—Growth in connected load in the eleven Western states.

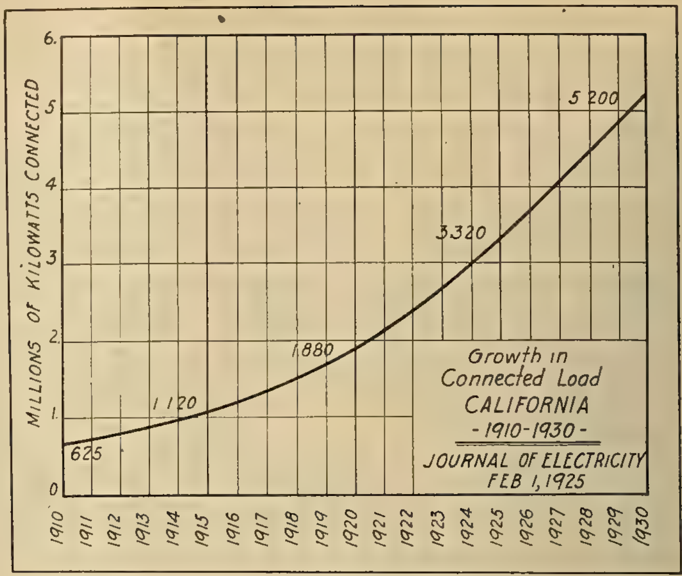


Fig. 2.—Growth in connected load in California.

4,855,000 kw., of which 3,260,000 kw. will be hydroelectric and the balance steam. It is interesting to note that while different methods were used to arrive at both the connected load and the installed capacity in 1930, the ratio which holds in 1925, namely, that of one kilowatt of capacity to each two kilowatts of connected load, will also hold in 1930. The installed capacity, both steam and hydro, for the different sections of the West at the present time is shown in Table II.

A gage of the progress of the industry is the relationship of the number of consumers to the kilowatt-hour output. This is shown in Fig. IV. The average number of kilowatt-hours generated per con-

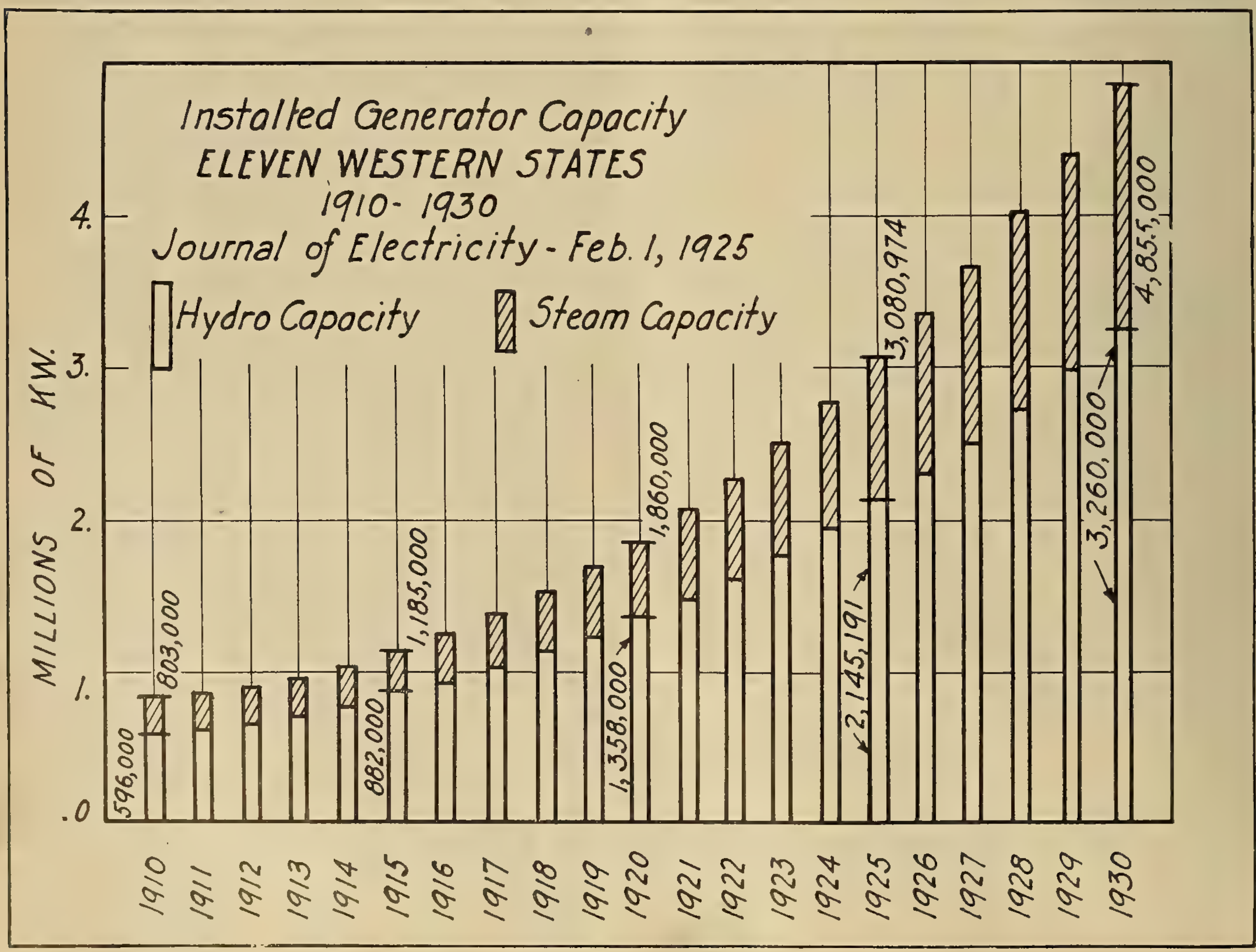


Fig. 3.—A study of the growth in installed capacity from 1910 to 1930.

Table II.—Installed Generator Capacity, Eleven Western Statas, Jan. 1, 1925.

	Hydro (kw.)	Steam (kw.)	Total (kw.
California and Nevada	1,060,650	527,918	1,588,568
Pacific Northwesn	632,680	186,755	819,435
Intermountain	451,861	221,110	672,971
Totals	2,145,191	935,783	3,080,974

sumer has grown from 4,180 in 1910 to 5,450 in 1924, and it is estimated it will reach 5,800 by 1930. Just what this figure will be in the future is problematical, but from the trend of the curves in Fig. IV it undoubtedly will increase at about the same rate that it has in the past.

The number of consumers in 1910 was 520,000; by 1925 it reached 2,199,000, a growth of 420 per cent. It is estimated that the number of consumers served in 1930 will be approximately 3,400,000 or 6.8 times the number served in 1910. The growth in kilowatt-hours generated has been even more phenomenal. With an annual output of 2,176,000,000 kw-hr. in 1910, the industry has grown to such an extent that in 1924 the production was 11,258,000,000 kw-hr. or approximately 21 per cent of the total for the nation. On the basis of past growth it is estimated the annual output will reach 19,750,000,000 kw-hr. by 1930. In 1924 72.9 per cent of the energy produced was generated in hydroelectric plants and 27.1 per cent in steam stations. The ratio of hydro to steam would have been higher had it not been for the unprecedented dry year in California that curtailed operation of the hydro plants.

A survey of the operation of the companies in the West during 1924 shows the following:

Increase in installed capacity	15 per cent
Increase in kilowatt-hour output	8.6 per cent
Increase in number of consumers	10 per cent
Increase in gross revenue from sales of energy	11.1 per cent

From present indications the same increase in installed capacity will hold for 1925. The same increase in the number of consumers should hold for this year, but there should be a more marked increase in both the gross revenue from the sale of energy and in the kilowatt-hour output, due to greater activity in California following the 1924 power shortage and the resumption of mining operations in the Intermountain region.

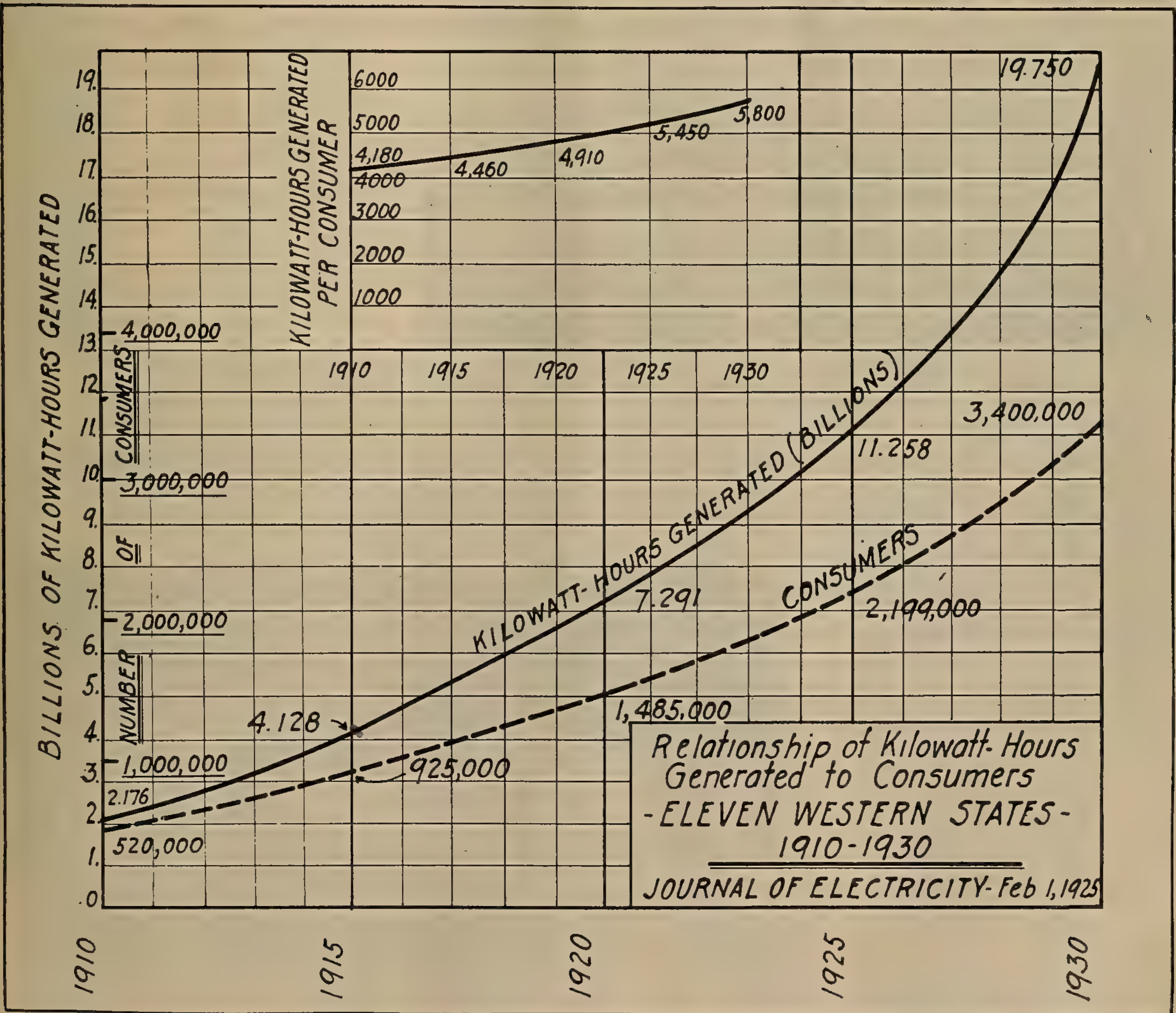


Fig. 4.—A study of the relationship of consumers to kilowatt-hour output in the eleven Western states.

CENTRAL STATION CONSTRUCTION OPERATION AND MAINTENANCE

New Outdoor Switching Station Finished at Lents

Addition to Existing Substation Embodies Interesting Application of the Latest in Switching Equipment

By W. C. FOSTER
Portland Electric Power Company, Portland.

The Portland Electric Power Company completed and put in operation in November, 1924, a new high-tension switching station at Lents, Ore., at a cost of approximately $150,000.

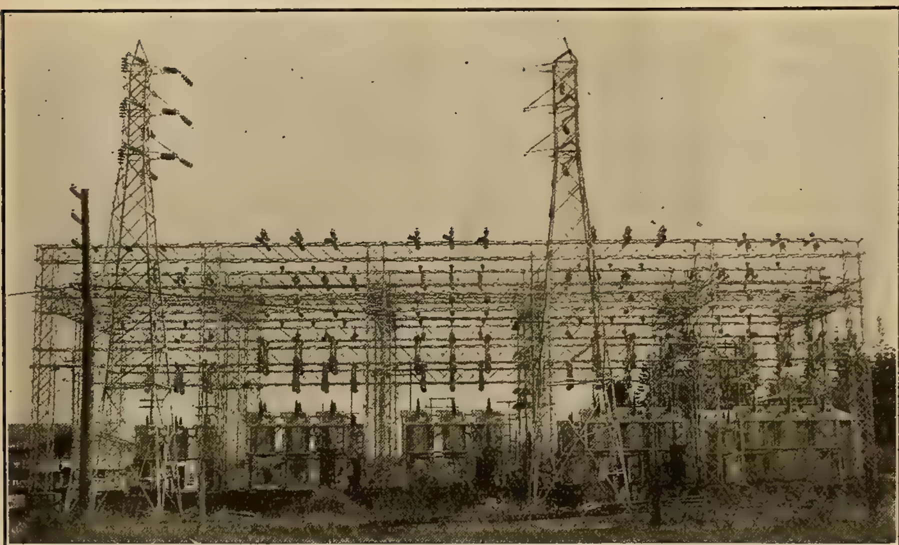


Fig. 1—Showing the general arrangement of the 143-ft. bus structure of the Lents switching station of the Portland Electric Power Company.

This station is located just outside the southeast boundary of the city and along the company's right-of-way between Portland and Estacada. Along this right-of-way are four 57,100-volt circuits, two of which are on steel towers and two on wood poles, transmitting energy from the River Mill, Cazadero, Oak Grove and Bull Run plants. The station is the terminal of these four circuits and is also a distribution center for 57,100-volt circuits to different city substations.

The station is the outdoor type and of steel construction, the steel being furnished by the Pacific Coast Steel Company of San Francisco. The structure covers a ground space of 49x143 ft. and is 43 ft. high. There are two buses running lengthwise of the structure, one a main bus and the other an auxiliary. The buses are of 500,000 circ. mil stranded copper wire, and connections to switches and lines are 250,000 circ. mil stranded and solid copper. Insulators are Ohio Brass Company 66,000-volt, both pin type and suspension units.

General Electric Company, FKO 39, 73,000-volt oil circuit breakers are used, each having bushing type double ratio current transformers. Disconnecting switches are used on each side of the oil breaker and for sectionalizing the bus. The disconnecting switch on the line side of the oil breaker is arranged with a separate blade and operating lever and is interlocked with the main switch lever so that the line may be grounded when the line switch is open. These switches were furnished by the Pacific Electric Manufacturing Company.

Each line is provided with one 33,000-volt potential transformer connected between one conductor and ground for synchronizing purposes. There are also two 66,000-volt potential transformers connected to main bus for balanced power and reverse power relay protection.

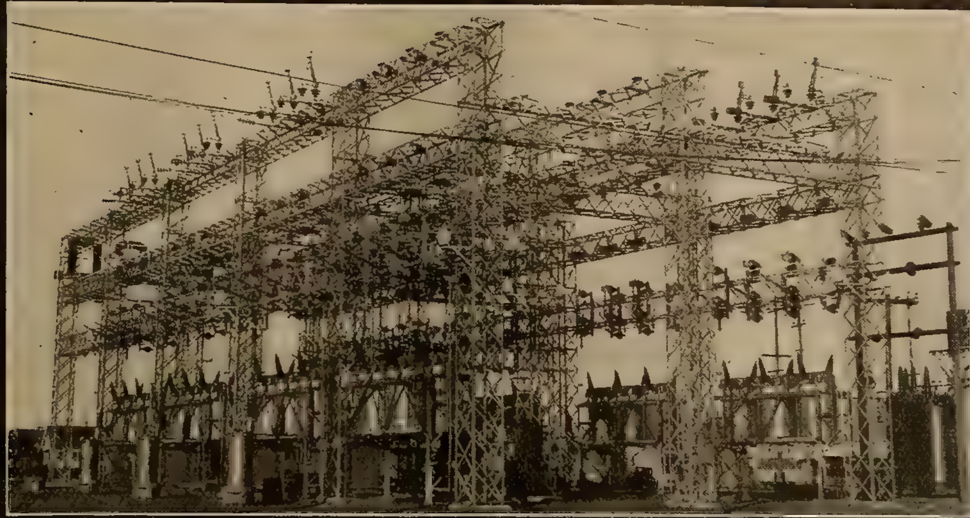
Each oil switch is controlled from the switchboard in the main substation building. This switchboard also carries a three-element combined overload relay and current indicator and synchroscope plug switch for each line. Parallel lines are protected by balanced power relays.

At the present time there are four incoming lines and three outgoing lines connected to the bus. There is also a 57,100/11,000-volt transformer connected through the usual disconnecting switches and oil breaker. Switches are so arranged that any line can be connected to the auxiliary bus and disconnected from the main bus without interruption to service. The auxiliary bus is connected to the main bus through an oil circuit breaker and disconnecting switches. This makes it possible to have any line oil circuit breaker out of service for inspection or repairs and still have the circuit connected to the main bus and protected by an oil breaker.

The structure is illuminated by seventeen standard post lighting units in opal glass, each containing a 300-watt Mazda lamp. On one end of the structure facing the principal street is the sign "P.E.P. Co.," illuminated by Mazda lamps.

The night-time illumination of the station has attracted considerable attention. The illustrations on this page and on page 105 give an idea of the adequacy of the lighting units that have been installed in this modern out-door substation of the Portland Electric Power Company.

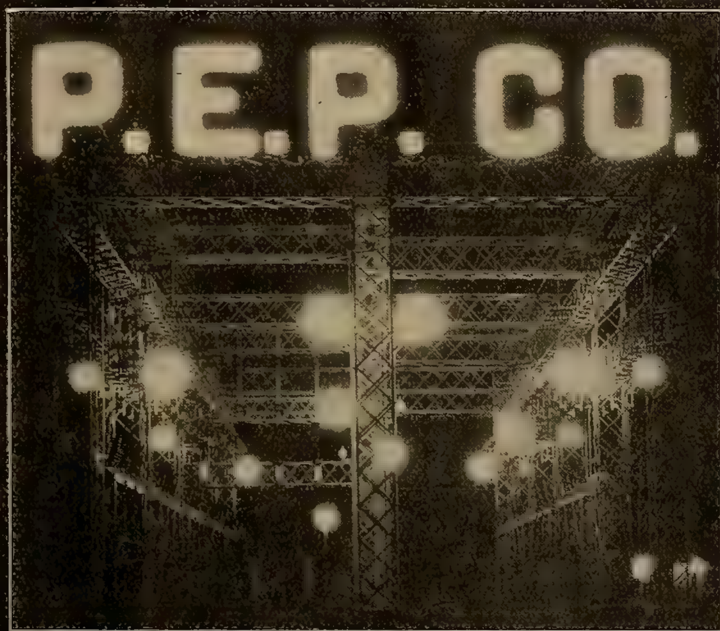
Fig. 2—A night view of the Lents switching station of the Portland Electric Power Company showing the illumination created by the yard lights mounted on the bus structure. No light other than the yard lights was employed in obtaining this picture.

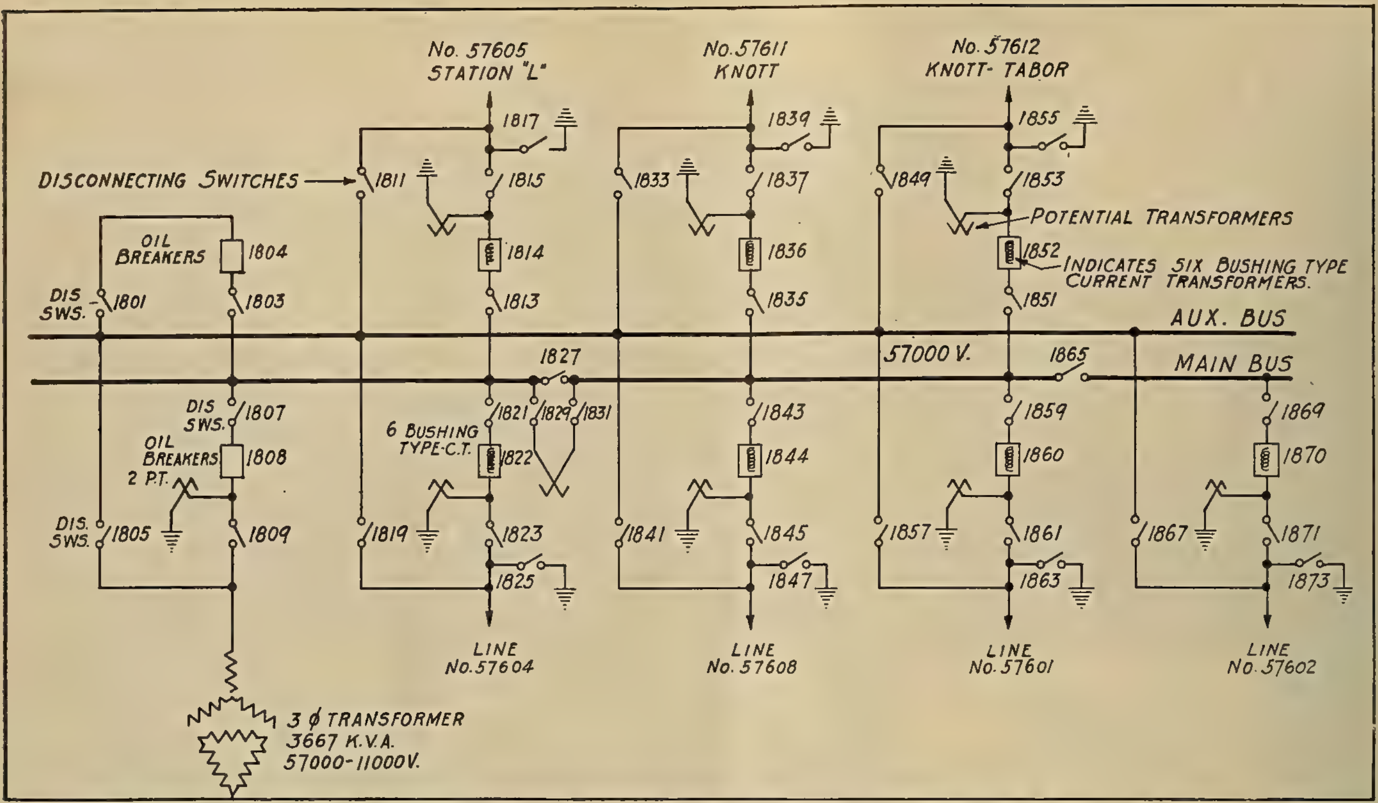


LENTS switching station of the Portland Electric Power Company, recently completed and put into service. The location is just outside the city and adjacent to the high-line right-of-way between Portland and Estacada, and serves as a terminus for the four 57,100-volt transmission lines from the River Mill, Cazadero, Bull Run and Oak Grove plants.

The bus structure covers a ground space of 49x143 ft. and is 43 ft. high.

Only the yard lights were used in taking the night pictures.





Schematic wiring diagram of the Lents switching station of the Portland Electric Power Company showing the layout of single operating bus and auxiliary bus. It will be noted that each oil switch and disconnect switch bears an identifying number. The designating numbers for each of the transmission lines tell the number of the line and the voltage of the line. The first two figures signify the voltage while those following identify the particular line. For instance, line No. 57608 indicates 57-kv. line No. 608. Lines of 11,000 volts are similarly numbered.

Electric Arc Welding Applied to Manganese Steel

Frogs and Crossing Castings Successfully Repaired Under Traffic by Electrically Deposited Metal.

Welding repairs to manganese-steel frogs and castings is done with steel rod having a manganese content of about 14 per cent. Where this work is done in track and under traffic it has been found that 5/32-in. rod with about 150 amperes in the arc circuit gives the best results. Where the work is done out of track at a repair yard, 3/16-in. rods with 160 to 170 amperes in the arc circuit may be used. The rod is operated on the positive side of the circuit.

Cooling the casting must be given the same care as in welding gray iron castings with mild steel rods. Manganese steel has peculiar properties and if allowed to cool slowly will be hard and brittle and entirely worthless. When using the 5/32-in. manganese-steel welding rod the casting should be cooled by applying water directly to the weld every three to five minutes. Further, it is desirable that, where possible, welding be done at several points over the casting in order that the heat will be widely distributed. The quenching effect obtained by the deposition of the hot metal on the cooled castings is about the same as if the hot metal were dropped into water. In the case of manganese-steel welding done out of track with 3/16-in. rod, water should be applied after each four or five inches of bead.

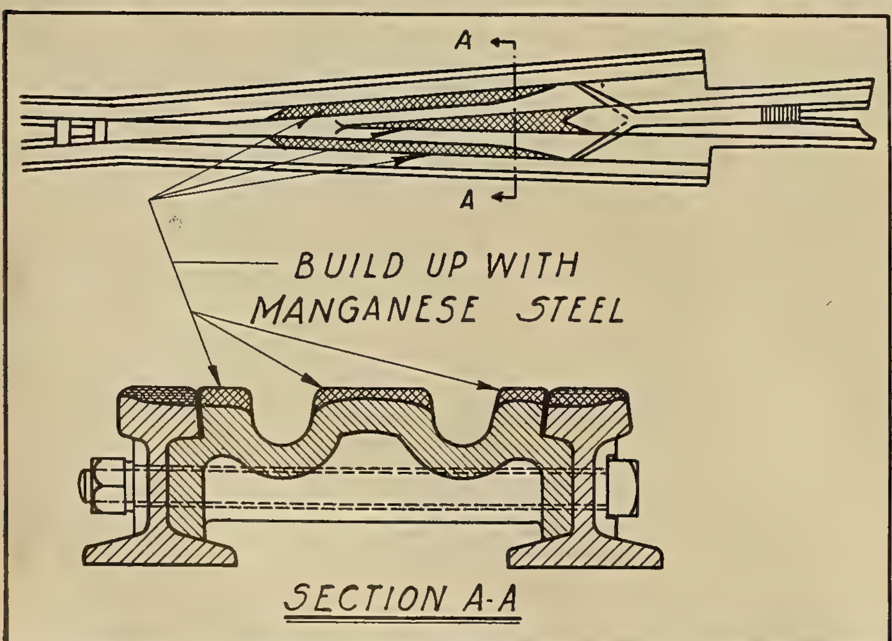


Fig. 1—Sketch showing a worn rail-bound manganese-steel frog built up with an electric arc outfit. Excellent service is obtainable from such a job if it is well done and if the amount of new metal built on the point of the frog does not exceed ⅝ in.

Hammering the newly applied metal down to a fairly good surface will be accomplished automatically by the wheels of the trains where the work is done in track under traffic conditions. However, where the work is done out of track considerable hammering with a hand or air tool may be necessary to keep a reasonably smooth surface. Particularly is this true where more than one layer is to be built on the piece under repair.

The method of building up a worn rail-bound frog is indicated in Fig. 1. On the manganese center of the frog manganese-steel welding rod is used, while on the wing rails high-carbon steel is applied. No water cooling is required in the application of the high-carbon steel to the wing rails. Particular attention is called to the dove-tail weld on the point of the frog and to the similar practice on the wing-rail section of the frog. This is absolutely necessary to prevent the wheels striking the built-on manganese steel all at once. By following this method the arrangement is such that the wheel will take on to the built-on section gradually, and after a few hundred wheels have

passed over the point no jar will be noticeable.

Attention should be particularly given to the building-up work on the point of the frog to prevent its getting too hot. More water is required for cooling in the application of the new material to the point of the frog than to the wing-rail section or the wing rail itself because of the narrow cross-section of the point.

Grinding is ordinarily not required where this welding is done under traffic. However, it is a good thing perhaps to have grinding equipment available for possible emergencies.

Frogs which have worn down more than ⅝ in. at the point may be built up for emergency service, but the result is

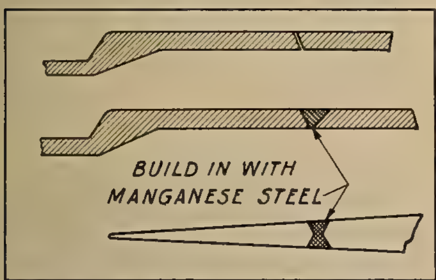


Fig. 2—Sketch showing emergency welding on a cracked manganese frog point.

rather uncertain. Owing to the fact that manganese-steel welding rod is "very wild," the point may not be all solid built-in material. The result of this is that the point will be knocked off within a week or so. It should be understood that the point is the weakest part of the frog and that a great many points are knocked off entirely new frogs.

Emergency welding occasioned by the cracking of manganese frogs is depicted in Figs. 2 and 3. Jobs of this nature cannot be expected to render the normal service life of a new frog but will give from nine to eighteen months of service under heavy traffic conditions.

In cutting out preparatory to welding,

Fig. 3—Welding method where two cracks occur less than seven inches apart on No. 10 frogs and larger. The section between the cracks should be removed and new metal built in. Repairs such as this and that shown in Fig. 2 are good for from nine to eighteen months under heavy traffic conditions.

the gas torch may be used without restriction, provided that a stream of water is directed on the managnese steel of the original casting immediately back of the cutting flame while the cutting operation is being carried on. The object of this procedure is to avoid getting the casting hot and thus damaging beyond repair the original properties of the manganese steel.

Castings that are completely cracked at the frog point cannot be successfully repaired by the electric-arc welding process. This failure is a frequent occurrence. However, electric welding offers no solution to the trouble. Cracks which occur only in the frog point and do not extend to the wing-rail section of the manganese casting are comparatively easy to repair as shown in Figs. 2 and 3.

Crossing castings are another place where wheel-bearing points become battered down by the wear and tear of

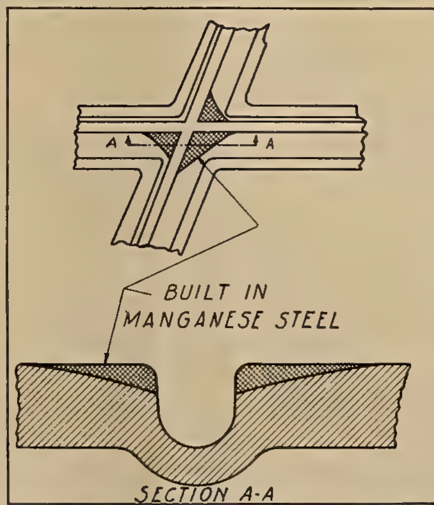


Fig. 4—Sketch of a manganese-steel crossing with the worn points built up by the electric welding process.

traffic. Fig. 4 shows how these points are built up by applying new metal with an electric welding outfit. Particular attention should be paid to the fillets of the corners of the crossings. The welded material should never overhang into the flange way as this will result in the failure of the built-in material. The drawing shows the repair job after it has been in service for several days. Generally it is somewhat difficult to get solid material in the corners of the crossings because of the "wild" behavior of the manganese-steel welding rod. Where the work is done under traffic, conditions are improved due to the hammering of the wheels. However, in spite of this, the built-in material should be from 1/16 to ⅛ in. higher at the corners than the original surface. After the metal has been hammered into a solid mass it will then come to the original size.

Fig. 5—Photograph showing a crossing built up in track under actual service conditions by using an electric arc-welder.

Grinders should be available for this kind of a job to put the fillet on the corners, as shown in the sketch, to avoid the possibility of knocking the corners off due to overhang. The annular edges shown on the built-up casting must be maintained so that the wheel will take on to the new material gradually rather than all at once.

In building up either frogs or crossings under traffic the whole surface should be brought up at the same time to avoid danger of derailment due to the wheels passing suddenly from the normal rail surface to one that is higher or lower. This is important and must be followed without question. For example, if the point of a frog were built up first without building up the wing rails correspondingly, the first wheel that passed over the point would either knock off the new metal, knock off the entire frog point, or possibly be derailed through the impact. If one wing rail were built up completely before the other parts were touched, a similar condition would obtain. If one corner of the crossing shown in Fig. 5 were built up and the other two untouched, it is obvious that serious trouble might occur when the first wheel went over. Approximately the same level must be maintained over the whole piece as the work progresses.

Where work is being done under traffic, accident to the welder should be guarded against by not permitting him to operate his arc unless an observer is at all times close enough to touch him to warn of approaching trains. Failure to observe this precaution is sure to result in an accident.

THE LINEMEN

By JAMES EDWARD HUNGERFORD.

They're ready for any old kind of a venture—
Heroic, all right, but their deeds are unsung;
They're chock-full o' grit and dead keen to adventure
Whenever there's 'lectric wires to be strung.

Just give 'em the word an' they're off in a twinkle,
With pliers an' climbers—alert, wide awake,
You don't have to show 'em; they know every wrinkle,
And don't give a rap the chances they take.

Just point out the job to be done, an' they'll do it—
A job that takes deftness an' courage an' grit;
They'll laugh at the hardships an' stick till they're through it,
Or die on the job, for they'll never say "Quit."

You'll find 'em up north, where the blizzards are ragin',
You'll find 'em down south, where it's hotter than sin;
They're perched up on poles where the clouds are rampagin',
Good-natured an' cheerful, but drenched to the skin.

Their job is to string up the wires, an' they string 'em,
Regardless of where they have got to be hung;
The rain it can pelt 'em, the hailstones can sting 'em,
But just the same, mister, those wires'll be strung.

IDEAS FOR THE CONTRACTOR

A Pipe Bending Device That May Be Built on the Job

Contractors very often through one circumstance or another permit their wire men to go on to a job without pipe bending equipment. It frequently happens in such cases that the journeyman finds it necessary to make one or more bends and in certain instances considerable time is lost in trying to construct apparatus for the purpose of bending pipe. The accompanying illustrations show two simple methods of bending pipe, using only the building studs and a few pieces of scrap wood. In Fig. 1, by nailing four blocks of wood to each of two adjacent studs, each pair of blocks being spaced sufficiently to take the full diameter of the pipe to be bent, and by nailing a strap over one pair of these blocks, an efficient pipe bending device is produced for making straight angle bends. In Fig. 2 use is also made of two adjacent studs and a pair of wood blocks and strap are fastened on one stud as above. On the other stud, however, is nailed a piece of wood with one face cut on an angle of about 45 degrees. This permits of making lateral or curved bends. These simple construction practices will often save a return to the contractor's store or other place of business to secure a pipe bending machine and will reduce correspondingly the cost of the job.

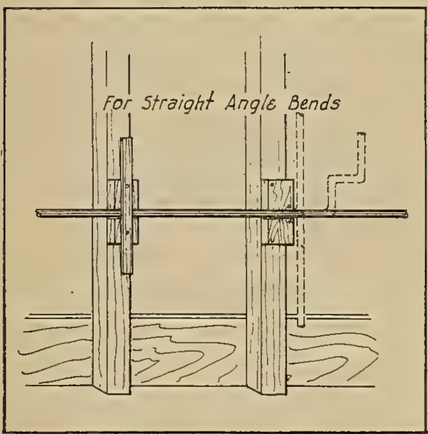


Fig. 1.

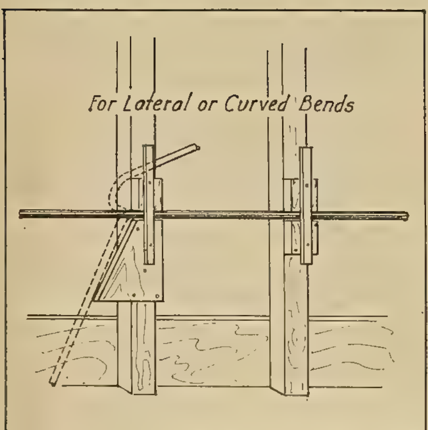


Fig. 2.

Simple Method for Finding Speed of an Induction Motor

By GEORGE N. HAWLEY,
Assistant Engineer, J. L. Mitchell, Oxnard, Calif.

When an induction motor is operating, a growling or rising and falling inflection in the humming of the core will be observed. This inflection is in reality a beat note due to the fact that the rotor core is being magnetized at a slightly smaller frequency than the stator core. Since the slip of the motor is inversely proportional to the frequency of the rotor current, this fact furnishes a simple method of finding the slip and speed of the motor provided the line frequency is known or can be assumed.

Count the number of beats or growls which occur during a minute, subtract this from the number of alternations per minute of the line current and divide this number by the number of poles which the motor has and the result will be the speed of the motor in r.p.m.

For example: Assume the line frequency to be 60 cycles; then the stator core is being magnetized at $60\times60\times2=7{,}200$ vibrations per minute. Then, if 120 beat notes per minute were observed, the rotor is being magnetized at $7{,}200-120=7{,}080$ vibrations per minute, and the frequency of the rotor current is:

$$\frac{7080}{60\times2}=59 \text{ cycles}$$

Now, if the motor has 4 poles, its speed will be:

$$\frac{7080}{4}=1{,}770 \text{ r.p.m., and the slip will be}$$

$$\frac{1{,}800-1{,}770}{1{,}800}=1.67 \text{ per cent.}$$

The same result can be obtained by considering the slip as being proportional to the difference in stator and rotor current frequencies, thus:

$$\frac{60-59}{60}=1.67 \text{ per cent slip.}$$

Obviously, this method is easier to apply when the line frequency and the slip are both small, as large frequencies mean many beat notes, which are difficult to determine.

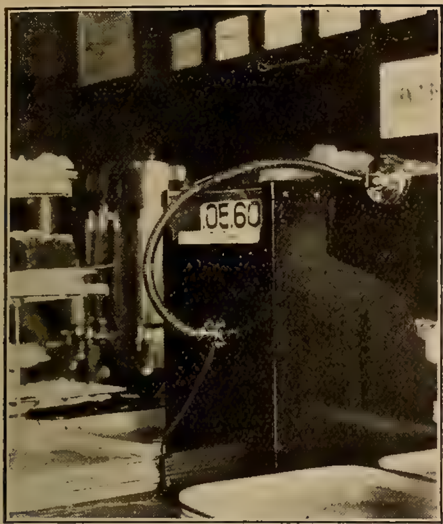
Loud Speaker Now Used to Place Orders in Lunch Room

To eliminate the unpleasantness occasioned by the calling out of orders from the counter to the kitchen, a loud speaking telephone system has been installed in Hart's Lunch Room, at 520 K Street, Sacramento, Calif. This is said to be the first installation of its kind and was designed by A. C. Breuner of the Western Electric Company, San Francisco, and C. J. Blair of the California Mechanical and Electrical Engineering Company, of Sacramento. The latter company installed the system.

Western Electric loud speaker mounted in kitchen of Sacramento, Calif., quick lunch room. A similar instrument is installed in the secondary kitchen in the basement.

The apparatus consists of a Western Electric loud speaking telephone system, and is made up of two Western Electric microphones ingeniously located at the cash registers on the lunch counter. This location was selected as being the most convenient and most easily accessible for the waiters. In the kitchen there is located one Western Electric loud speaking unit and a similar unit is installed in the secondary kitchen downstairs, these two being controlled by a two-way switch. The loud speakers are mounted high on the wall, well over the cook's head and out of the way.

The installation of this system has allowed the waiters to give orders in a perfectly natural tone of voice, by merely speaking into the transmitter. This has resulted in the elimination of the annoyance occasioned to patrons by the loud shouting of orders from the counter to the kitchen, and has also



Western Electric microphone, attached to cash register in a Sacramento, Calif., quick lunch room. One microphone is attached to each register.

served to reduce the number of errors made in filling orders in the kitchen. The general character and tone of the place has been materially raised, and customers have appeared well pleased and have made many favorable comments on the improvement. Noteworthy facts in connection with this installation are that the waiters and cooks both express themselves as highly pleased with the new system and that service has been improved.

This installation opens up a new field of electrical application and offers to contractor dealers extensive opportunities for increasing their activities.

Sacramento Valley Electrical Society Holds Meeting

The Sacramento Valley Electrical Society held its regular monthly meeting at the Hotel Land, Sacramento, Calif., Jan. 14. The principal speaker of the evening was George F. Maynahan, inspector, California State Motor Vehicle Department, who gave an interesting address on automobile headlight illumination. Mr. Maynahan explained the present laws and the methods used in testing various headlight devices.

It was decided that for the February meeting of the organization a trip would be made Friday, Feb. 6, to Oakland, Calif., where the members would be taken through the National Lamp Works of the General Electric Company and through the company's radio station KGO. W. J. Delehanty of the General Electric Company and Walter Evans of the Sacramento Northern Raliroad are in charge of arrangements.

Minimum Wiring Specifications of B. C. Service League

Electrical contractors everywhere will be interested in the minimum wiring specifications for residence service recently drawn up by the Electrical Service League of British Columbia. This specification is as follows:

House Seven Rooms and Over—Service to consist of one and one-half inch conduit with three No. 2 wires. Main switch to be 100 Amp., 3 pole. Cabinet to have provision for four spare circuits.

House Six Rooms and Under—Service to consist of one and one-quarter inch conduit with three No. 4 wires. Main switch to be 100 Amp., 3 pole. Cabinet to have provision for two spare circuits.

Range wiring to be one and one-quarter inch conduit with three No. 6 wires, and to be completed to point in kitchen.

Lighting

Ceiling outlets in each room, main halls and main stair turn; also over laundry tubs, in front of furnace, over range, and over sink in kitchen.

Wall brackets in sitting room, dining room, bedrooms and bathroom.

Switches

All stairway lights should be controlled by separate sets of three-way switches.

Garage

Circuit should be provided.

Convenience Outlets

(These to be of Duplex type.)

Two in dining room One in sun-room
Two in living room One in den
Two in each bedroom Two in laundry
Two in kitchen
One in both upstairs and downstairs hall.

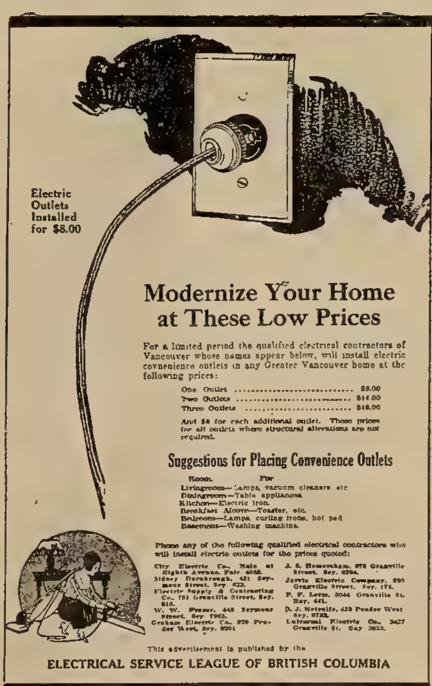
N. B.—Plumbing specifications should provide a hose bib for filling washing machines and drain for running same off.

N. B.—Houses six rooms and under, where woman does her own work, should be consistently wired for ranges. Demand is increasing daily.

It will readily be seen that houses wired according to the above will under ordinary circumstances provide ample capacity for complete electrification of the home. In addition this specification materially improves the character of the installation and makes a much better job from the contractors' viewpoint.

Cooperative Plan Helps to Sell Convenience Outlets

A conspicuous example of cooperation between the central station and the contractor-dealers recently occurred in



Newspaper space was used extensively in the campaign to sell convenience outlets. Above is copy of four-page ten-inch advertisement run by the Electrical Service League of British Columbia to tie in with dealers' mail advertising.

Front of blotter used for promoting convenience outlet business. The back of this blotter carries a brief description of what a convenience outlet is, and this description closes with the statement, "They are not expensive."

Vancouver, B. C. The British Columbia Electric Railway Company felt that convenience outlets could be merchandised the same as percolators, toasters and irons are, and presented their ideas to the local contractor-dealers. A plan was soon evolved whereby the contractor-dealers, basing their estimates on past installation experience, decided that they could afford to install one outlet for $8, two outlets for $14 and three outlets for $18, provided all the outlets were installed at one time. The central station advertised extensively in the newspapers, selling the idea of convenience outlets, and at the same time incorporating in its advertising copy the names of the contractor-dealers who were cooperating. Blotters were also used showing convenience outlets actually in use in homes. The reverse side of these blotters contained a small amount of printed matter intended to sell the idea. This matter closed with the statement, "They are not expensive." Four-page folders were prepared descriptive of convenience outlets and their application, and the back cover of these folders showed a list of cooperating dealers.

Experience soon showed that those contractor-dealers in Vancouver who had not agreed to cooperate in furtherance of this plan were nevertheless taking advantage of the campaign and were installing convenience outlets at prices somewhat less than those which experience had shown to be necessary. For this reason the price situation was very shortly somewhat disturbed. The campaign has proceeded quite aggressively, however, and the net result has been the installation of several hundred additional convenience outlets. This plan has apparently worked out well in Vancouver and could be applied with equal desirability in any Western city.

NEWS OF THE INDUSTRY

Federal Control of Boulder Dam Power and Water Favored

In answer to a request for a report on the Swing-Johnson Bill, which provides for the erection of the Boulder Canyon dam by the federal government, Elwood Mead, commissioner of reclamation, favors authorization of the Boulder Canyon reservoir and states that the United States should at once endeavor to reach a friendly understanding with Mexico in regard to the use of the present international canal. Under the present contract with Mexico, half of the water that is diverted by the canal that provides irrigation for the Imperial Valley of California is subject to the call of Mexico.

Commissioner Mead favors federal control of both irrigation storage and power development at the Boulder Canyon project and recommends that the power be sold at the generating plant to either municipalities or public utility companies capable of distributing the energy. In this connection he states:

It is my understanding that the Senate bill authorizing the Boulder Canyon project contemplates an allocation of power opportunities to the different states which are directly interested in the Colorado River Compact, and I assume that this plan was adopted to enlist the interest and cooperation of the other states and make this measure less local. While realizing the expediency of this action, I cannot avoid believing that carrying out the plan would be difficult. It will simplify the construction of the power plant and make its operation more efficient if irrigation storage and power development are unified and made an integral part of one project. I believe both the reservoir and the power plant should be parts of a federal enterprise. In this way controversy will be averted over the manner in which water is delivered from the reservoir, and it is the only way in which it can be averted. If one authority is interested in power and another in irrigation, controversy will be inevitable. The largest results from power require an equalized delivery of water throughout the year. The largest results for irrigation require a widely variable delivery. There will be no agreement as to which use is to control unless one interest owns both the reservoir and the power plant; but if the government builds both it will shape the policy regarding the release of water and be in a position to make the regulation of the river for irrigation the paramount consideration, and this is as it should be.

Power should be sold at the generating station on long-time contracts. The purchaser should attend to the distribution. It is known that the city of Los Angeles will be a customer. It is believed that other cities will desire to obtain power for municipal purposes, and there are great corporations already engaged in the distribution of power who will welcome an opportunity to obtain additional electric energy without the large investment required for its generation. No fear need be felt, therefore, as to obtaining a market for this power on terms which will insure the repayment of the money spent in power development with a reasonable rate of interest, or that the power revenues cannot in time be applied to help pay for the storage works with interest. It is believed, therefore, that in financing this interprise interest should be required on all the money advanced by the government. The rate should be low; 4 per cent is suggested. The payments on principal should be amortized and should extend over a long period of years, and no payments of principal should be required until the works are completed and the water and the power brought into use. During this interval the accumulated interest should be added to the capital cost, and when payments begin all revenues both from irrigation and power should be applied to payment of the debt to the government. When that has been accomplished, it will be time enough to consider a distribution of the benefits to the states interested in the stream.

In speaking of the actions of the various states on the Colorado River, Commissioner Mead believes that as soon as the Boulder Canyon project is authorized a study should be made of the opportunities for irrigation and power development in the other states that are directly interested in the Colorado River Compact. He recommends the preparation of a plan of development for these states as comprehensive as the Boulder Canyon project.

Bill Is Proposed for Conservation in Watershed Counties

A bill prepared by H. E. Dillinger, assemblyman of Placerville, Calif., has for its object the conservation of water for lands of counties in which the water originates to the extent of 15 per cent of the total appropriated under permit from the State Department of Public Works, Division of Water Rights.

The measure is said to be aimed particularly at the proposed project of the East Bay Municipal Utility District, which plans to furnish Oakland, Berkeley, Alameda and adjacent cities with water from the Mokelumne River. Under the proposed bill Calaveras and other counties affected by its provisions would have to be included in any plans made for a water supply for the cities mentioned. The author of the bill contends that such legislation would tend to protect watershed counties.

Appliance Companies Abandon Plans for Merger

After a considerable period of negotiation, plans looking toward the consolidation of the Hurley Machine Company and the Edison Electric Appliance Company, both of Chicago, and the Electric Vacuum Cleaner Company of Cleveland have been abandoned.

According to a statement attributed to A. J. McCoy, vice-president of the Hurley Machine Company, a careful review of the considerations involved led to the conclusion that the advantages resulting from such consolidation at this time were not sufficient to warrant it.

Washington Utility Gets Permit for Lower Baker Dam

The Puget Sound Power & Light Company, Seattle, has been granted a permit for the construction of its Lower Baker Reservoir on the Baker River, Skagit County, Washington, by the state hydraulics department. The reservoir will be used in connection with the Eden power plant development, which will cost about $4,000,000 when completed and which will have an estimated capacity of 65,000 hp. Construction work is to be completed by June, 1926.

Construction of Shasta Station to Be Started in May

Preliminary work on the construction of the Pacific Gas and Electric Company's Shasta substation, to be located one mile north of Cottonwood, Calif., near Redding, has been completed to such an extent that the company expects to have the station built and in service by June 1. All designs have been prepared and major equipment has been ordered for this station, which will cost about $500,000. The substation will be used principally to step up current received from the Copco 2 plant of The California Oregon Power Company.

The substation will be located on an 80-acre plot of ground and will be of reinforced concrete. The apparatus to be installed will include four 13,333-kva. transformers, oil switches and other necessary apparatus. The building will be equipped with a 50-ton crane for handling the transformers and other heavy equipment. One of the transformers will be kept as a spare.

The station will receive energy from The California Oregon Power Company over a 110-kv. line that has recently been completed by that company (Journal of Electricity, Dec. 1, 1924, page 417) and over 42 miles of line of the same voltage that is being built by the Pacific Gas and Electric Company. The new line being constructed will be of the two-pole type and will run south from Delta, the terminus of the California-Oregon line, to Shasta substation.

At the Shasta station the voltage will be increased from 110 kv. to 220 kv. and will be transmitted to the Vaca-Dixon substation over the Pit River lines.

Senator Promises to Introduce Public Ownership Bill

With the opening of the 1925 session of the legislature of the State of Oregon comes the announcement by George W. Joseph, senator from Multnomah County, that he will again propose a resolution to submit to a vote of the people under the referendum a constitutional amendment authorizing the state to go into the power business. The amendment is similar to the one that the senator proposed at the 1921 legislative session, and similar to the one sponsored by the Public Ownership League of Portland (Journal of Electricity, Sept. 15, 1924, p. 218).

Senator Joseph said in part: "I am prompted to resubmit it (the amendment) to the coming session. I am convinced that if Oregon is to make any progress in cheap power development the state must take the initial step, and I have so drafted the amendment that the state may either proceed with water power development independently or cooperatively with the State of Washington or in cooperation with both."

San Diego Company's Budget for 1925 Is Announced

Major construction having been completed in 1923 and 1924 and unusual conditions having been survived successfully during the power shortage, during which it served sections less favored with surplus power, the construction budget of the San Diego Consolidated Gas & Electric Company, San Diego, Calif., for 1925 will be confined principally to completing works already started and to many small improvements, it was announced recently. The budget calls for the expenditure of over $2,500,000.

Much of the electric distribution work for 1925 will be concentrated on the building of a new line to serve the El Cajon Valley, augmenting existing and heavily loaded lines to this agricultural section. Some rebuilding of the high line along the coast and the moving of portions of it to more favorable terrain, with the rebuilding of lines into National City and Chula Vista, are also to be done. Designs and plans for the proposed Station D in the University and 30th district will be completed during the year, although no construction is contemplated.

New test equipment for the electric meter department is provided for in the year's budget, and certain changes in the veteran Station A are to be made to accommodate five new feeders as well as to provide space for switch and transformer installation for a bank of three 3,000-kva. transformers. Supplementary circulating water pipe lines, to furnish more sea water to the condensers on the turbo-generators at Station B are also to be started in 1925, to be completed in 1926.

To take advantage of a large and well adapted room in the basement of the Electric Building, a special and unique display and demonstration room for gas and electric appliances will be fitted up. Demonstrations in home economics, classes in electric cooking and displays of dealers' standard gas and electric appliances will be held in this room.

Another item in the San Diego company's budget is a provision for the purchase of two electric trucks to be used experimentally on the type of work required by that company.

Puget Sound Company Budget for 1925 Is $8,000,000

Providing for the development of additional capacity, extensions of transmission and distribution lines, construction of new substations and improvements of various kinds, the 1925 budget of the Puget Sound Power & Light Company, Seattle, calls for an expenditure of between $8,000,000 and $9,000,000 during the coming year, according to a recent official announcement by A. W. Leonard, president of the company.

The outstanding single item in this budget is the Baker River development, scheduled for completion Oct. 1, 1925, by which 48,000 hp. will be made available in the first unit, with the possibility of increasing this capacity to 80,000 hp. later by the installation of additional units. Included in the Baker River project is the construction of three transmission lines: from the plant to Sedro-Wooley, Wash., 25 miles at 110 kv.; from Sedro-Wooley to Bellingham, 25 miles at 60 kv., and from Sedro-Wooley to Everett, 45 miles at 110 kv. (Journal of Electricity, Sept. 15, 1924, p. 220.) The Everett line was completed toward the end of 1924, and work on the Bellingham line was started, but about half of this transmission line work was carried over into 1925. Two new substations are also included in the project. One of 13,500-kw. capacity will be built at Sedro-Wooley, and the other, of 27,000-kw. capacity, will be at Everett. The latter will be the largest substation in the Northwest and will cover an entire city block.

Second in importance to the Baker River development is the installation of a fourth unit at the White River plant, between Seattle and Tacoma. This unit, which was brought into service in January, 1925, increases the capacity of this plant from 60,000 hp. to 80,432 hp. Another item in the power generation division of the budget calls for the completion in the early spring of a 1,500-hp. hydroelectric unit added to the plant at Dryden, Wash., near Wenatchee.

The estimated cost of the proposed extensions to the distribution system of the company appearing in the budget totals nearly $1,500,000. These extensions, which are scattered over the entire territory served by the company, are to bring service to communities not now served and to improve service already established.

Official Investigates Hydroelectric Development on Coast

To investigate hydroelectric development in this country, as well as other subjects of interest, Dr. Earl Page, minister of state for the treasury of the Commonwealth of Australia, is making a visit to the Pacific Coast. He is accompanied by his wife and daughter, and by Hon. J. Heathershaw, chief accountant of the treasury department, and V. Bagot, private secretary. The party landed in Vancouver, B. C., and is traveling south, making short visits in all the principal cities.

In an interview accorded to a representative of the Journal of Electricity, Dr. Page said that in his study of electric power development, he was primarily interested in the standardization of generation and transmission voltages and in the application of electricity to rural uses. Dr. Page stated that he expected to learn much about these two phases of the electrical industry through conference with some of the officials of the leading utility companies on the Pacific Coast, where tied-in systems have reached a high degree of efficiency and where electric power is finding a wide and diversified usage on the farm.

In Portland, where he remained two days, Dr. Page consulted with O. B. Coldwell, L. T. Merwin and Lewis A. McArthur, vice-presidents and general managers of the Portland Electric Power Company, the Northwestern Electric Company and the Pacific Power & Light Company, respectively.

Inductive Co-ordination Report Published.—The American Committee on Inductive Co-ordination has issued its first report. This report is dated Nov. 12, 1924, and covers the organization, scope and personnel of the committee. G. C. Hecker at 8 West 40th Street, New York City, is the secretary.

Steam Plant Put in Service in Coos Bay, Ore., District

The latest generating plant to be brought into service in the Northwest is the steam plant of the Mountain States Power Company, Albany, Ore., located near North Bend, Ore., in the Coos Bay district. This plant, which was commenced in April, 1924, and put into operation in December last, has at present installed 6,700 hp. It is built on the unit system, with a temporary tile wall on one side to permit of expansion for the addition of units up to a total of 40,000 hp.

The plant consists of three main buildings, the power plant proper, the fuel storage building, and the fuel unloading tower. The plant burns hog fuel, which is delivered from nearby mills in barges and mechanically conveyed to the boilers. The generating plant proper, which is constructed of steel and concrete, is divided into three compartments, boiler room, turbine room, and switching galleries. Condenser water for the turbines is drawn from Coos Bay, while boiler feed water comes from the regular city supply.

The plant was constructed under the supervision of George F. Phythian, construction superintendent for the Byllesby Engineering & Management Corporation.

Resale Rate Increase Sought by P. G. and E. Company

At a hearing before the California Railroad Commission held Jan. 15, the Pacific Gas and Electric Company, San Francisco, presented arguments in support of its application to increase its resale rates. Through W. G. Vincent, Jr., vice-president and executive engineer, and B. B. Beckett, assistant valuation engineer, the company stated that it had lost $400,000 on electric power resold to twenty-four power companies and municipal plants throughout northern and central California, and contended that it should be allowed a profit of 8 per cent on its investment rather than incur a loss.

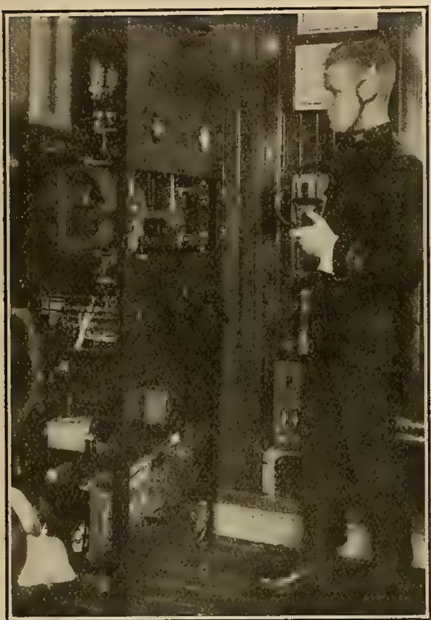
The hearing was put over until Feb. 9 to allow the companies and plants affected to present arguments opposing the granting of the increase requested.

Line Extensions Made by Texas Company.—Completion of its high-tension transmission from El Paso, Texas, down the valley of the Rio Grande has been recently effected by the El Paso Electric Railway Company. This line brings electric power to the towns of Ysleta, San Elizario, Clint and Fabens as well as to industries along the route. The company's system also has been extended from El Paso up the valley as far as Anthony, N. M., and a further extension to Las Cruces, N. M., is actively planned.

Material to Be Bought for Towers for Hetch Hetchy Newark-San Francisco Transmission Line.—The Board of Supervisors of San Francisco recently authorized the city engineer to exercise the city's option on material to be purchased for the steel towers for the Hetch Hetchy transmission line between Newark and San Francisco. The option, obtained several years ago from the Pacific Coast Steel Company, had expired but was reinstated by the company.

Radiophone Enables Ship-to-Ship Conversations at Sea

Radio telephone equipment, under favorable weather conditions capable of covering a distance of 350 miles in the day and 700 miles at night, has been installed on the S.S. Maui, flagship of the Matson Navigation Company's passenger fleet operating between San Francisco and Honolulu. Similar equipment but of greater capacity has been in operation since 1922 on the S.S. Matsonia, sister ship of the Maui. Through the installation on the Maui, passengers on the two vessels may talk with one another or with friends having radio receiving sets in San Francisco or Honolulu.



Panel board of radio telephone set recently installed on S.S. Maui.

Passenger on S.S. Maui using radio telephone set to converse with S.S. Matsonia.

The radiophone installed on the Maui is a five-tube, 250-watt installation including interrupted continuous wave, continuous wave and radiophone equipment. The Matsonia's equipment has a rating of 1,000 watts, and under favorable weather conditions the vessel has held telephone conversations with ships and stations 1,200 miles distant, according to officials of the Radio Corporation of America, which installed the sets.

As the Matson liners, Maui and Matsonia, pass in midocean halfway between San Francisco and Honolulu, 1,045 miles from land, they are now able to actually speak with one another practically every day but one of the six days required to make the voyage. The radiophone is used not only by passengers but is often employed by officers of the vessels in order to transact company business while at sea in the same manner that the telephone is used on land.

Rates have not been established for the ship-to-ship radio telephone service, and it is at present free for passengers to use. Equipment identical to that on the Maui is installed on the Admiral Line's coastwise steamer H. F. Alexander.

Another Electric Home Planned by Tacoma Electric Club

A second electric home is to be built in Tacoma, Wash., in 1925, as a demonstration of what the application of electricity in the home can mean in the way of modern comfort and efficiency, according to a recent decision of the electric home committee of the Tacoma Electric Club. The 1925 home will be built at North 22nd Street and Union Avenue, in a district adjacent to the campus of the new College of Puget Sound, and to the site of the Cushman power plant substation. Last year an electric home, officially called "Electro-Ease," equipped with every possible electric household convenience, was viewed by more than 30,000 people. This success encouraged the electrical men of the city to make another exhibit this year.

The 1925 home will be a residence of five rooms, all on one floor, and will demonstrate the possibilities of electrical uses for the small home-owner. The 1924 home was a two-story structure, of somewhat more pretentious character. From ice plant to radio, the new bungalow will be electrically complete, and it is now planned to get an expert of the National Electric Light Association to come to Tacoma to design the lighting.

The electric home committee consists of B. R. Nichols of the city light department, chairman; John Parkhurst, Tacoma Electric Company; Charles Stewart, Stewart Electric Company; Harry Matthews, City Lumber Company; Herbert Brotherton, L. Schoenfeld & Sons; Clarence E. Brown, Western Building Company; George Barlow, C. S. Barlow & Sons.

Contract for Tacoma Substation Is Awarded.—The contract for building the proposed substation for the Cushman power project, Tacoma, Wash., has been awarded to Dougan & Chrisman, Seattle contractors, on their low bid of $166,470.80. The contract is for the substation proper and tunnels for the footings for the outside equipment, and for the steel structures to support the heavy bus connections. The structure will be placed on a double-lock site and will be of reinforced concrete throughout.

Power Company Given Judgment in Rate Case

Judgment for more than $500,000, including accrued interest, was recently awarded the defendant in a suit brought by the Market Street Railway Company against the Pacific Gas and Electric Company, both of San Francisco, Calif. The dispute arose over rates for electric power fixed by the California Railroad Commission.

In 1909 the power company agreed to supply power to the railway company at certain rates, the contract to run until 1953. The rates named were maintained until 1918 when, due to increased costs, the Railroad Commission authorized an increase and since then has allowed additional increases. The railway company paid the contract rates but refused to pay the higher rates and brought suit, contending that the power supplied to it never became a public utility because the contract was private, thus barring the Railroad Commission from jurisdiction.

In his decision Superior Judge Walter P. Johnson ruled that the power was furnished as a public utility and that any private contract between public utilities is always subject to change by the commission. The judge also stated that if the increases allowed were granted in error by the Railroad Commission the railway company can obtain relief by application to the state supreme court for a review of the matter.

Cost of Valuation of Utilities Estimated at $130,000

A progress report on the valuation of the properties of the Pacific Gas and Electric Company and the Great Western Power Company within the city of San Francisco has been presented to the San Francisco Board of Supervisors by the California Railroad Commission, which is making the appraisal. The report states that on Dec. 31, approximately 55 per cent of the work had been done at a cost of approximately $69,600. It is estimated that six and one-half months will be needed to complete the work of appraising the two systems and that the total cost will be approximately $130,000.

Special studies of severance damages are being prepared for the Board of Supervisors by H. G. Butler, recently power administrator for the Railroad Commission, and E. F. Scattergood, chief electrical engineer of the Los Angeles Bureau of Power and Light. This work is being done separately from that of the Railroad Commission.

Ruling Holds Irrigation District Not Public Utility.—The California Railroad Commission has rendered a decision to the effect that an irrigation district is not a public utility and that the commission has no authority to fix rates at which such district may contract to supply electric power. The ruling was made recently when the Railroad Commission refused to fix a rate schedule for power supplied to the San Joaquin Light & Power Corporation, Fresno, Calif., by the Turlock Irrigation District, Turlock, Calif., under an agreement made March 11, 1924. The agreement itself was approved.

Long Established Concern Moves Into New Home

Garnett Young and Company, one of the leading manufacturers' agents on the Pacific Coast, have recently moved their San Francisco office to new quarters at 390 Fourth Street, that city. The building was especially constructed to meet the requirements of the business of this firm. It is especially arranged to expedite the handling of the various lines represented by the company, and particular attention has been paid to simplifying stock arrangements.

New Building of Garnett Young and Company, 390 Fourth Street, San Francisco

The business of Garnett Young and Company has been established for thirty years, and has been conducted by the present management for the past nineteen years. Garnett Young is treasurer and general manager. A. E. Rowe is sales manager, San Francisco district; R. J. McHugh, sales manager, Los Angeles district; Fred Larkin, sales manager, Northwest district, with headquarters at Seattle, Wash. R. B. Peterson is assistant to Mr. Rowe, and the company has several salesmen in each district. E. C. Kinsey is assistant secretary of the company, and S. L. Hawken is office and service manager at San Francisco. The entire sales staff has been with the company for eleven years or more, some of the men having been with the company a much longer time.

The new location is one particularly well adapted to the company's business and is convenient to all transportation facilities. The building is Class A, of reinforced concrete construction and of special design to meet the needs of the firm.

A feature of the opening of the new quarters was the presentation to Mr. Young of a set of office furniture, the gift of the sales staff.

Some of the lines represented throughout the Pacific Coast are Chicago Signal Company, Hart & Hegeman Manufacturing Company, Harvey Hubbell, Inc., National Metal Molding Company, Simplex Wire & Cable Company, Stromberg Carlson Telephone Manufacturing Company.

Fifty-five Millions Spent by P. G. and E. in 1924

Fifty-five million dollars was spent by the Pacific Gas and Electric Company, San Francisco, during 1924 for system betterments and extensions. This figure covers both the electric and gas departments of the company during the period.

The development program included work on Pit 3, the raising of the Lake Fordyce dam, increasing the capacity of the Sacramento steam plant, construction of transmission lines, construction of new substations, rebuilding and extensions to existing substations, erection of a new general warehouse, additions to the gas-generating and to the gas-holding equipment, extensions to gas-distribution systems and other similar activities.

At the beginning of 1924 the Pit 3 project was about 20 per cent complete, while the close of the year saw the job approximately 65 per cent finished. Excavation for the diversion dam has been completed and some 55,000 cu.yd. of concrete have been poured. There will be 80,000 cu.yd. in the completed dam. The tunnel has been holed through and work is progressing on the lining job. It is estimated that some 75,000 cu.yd. of concrete will be placed in the tunnel. Foundations for the power house are complete, the steel frame is rising into place, and excavations for the penstocks are completed. Remaining work is being rushed, and it is expected that this plant will add its 81,000-kva. capacity to the system along in July of this year.

Additional capacity is being provided for at the Drum division plants to use the 27,600 acre-ft. storage which will be added to Lake Fordyce on the South Yuba River through the raising of the dam some 47 ft. This work is now about two-thirds complete and 6,000 acre-ft. of storage already have been created through the use of 12 ft. of the new dam structure. The new forebay is completed and the penstock is nearing completion.

The expenditure of a million dollars in four months' time served to place in operation a new 12,500-kw. generator at the Sacramento steam plant, more than tripling the capacity of that plant.

San Francisco Bay region substation capacities were increased several thousand kva., both a.c. and d.c., to care for increasing commercial and industrial demand.

Line construction included the completion of the two Claremont-Newark 110-kv. lines; the erection of towers and stringing of wires over a major portion of the double-circuit tower line that will connect Pit 3 with the Pit-Vaca-Dixon 220-kv. line; the laying of foundations and erection of towers on the extension of the Newmark-Martin 110-kv. lines from Cooley landing to Martin substation in San Mateo County to make Pit River power available in San Francisco; and the construction of several telephone lines, including a 190-mile line from Vaca-Dixon substation to Redding, primarily for dispatching purposes.

The new warehouse located in Emeryville, which is designed to provide adequate space for a junk shop, foundry, forge and pattern shop, machine and electric shop, and testing laboratory, will soon take shape, as the preliminary grading and foundation work are largely completed.

Work is also well under way on the new seventeen-story general office building at Market and Beale Streets, San Francisco, which is expected to be completed by April 1.

The purchase of the Swayne creosoting plant at Redding, Calif., was also recently consummated. This plant, previous to its purchase, had been treating about half of the Pacific Gas and Electric poles, but will henceforth treat the entire stock, which is expected to amount to 50,000 poles for 1925.

Error in Washing Machine Directory Noted.—In the Washing Machine Directory, (Journal of Electricity, Oct. 15, 1924, page 293) the west of the Rockies price of Sunbeam washer was incorrectly listed. The machines manufactured by the Sunbeam Electric Manufacturing Company, Evansville, Ind., should have had the following prices for retail trade west of the Rocky Mountains:

No. 6	$150
No. 8	$170
No. 18	$260

Correction of Error in "Smiles" Contest Report.—In the Jan. 15 issue of the Journal of Electricity, page 67, a report of the results of the recent "Smiles" contest was published. Inadvertently the name of C. W. Hughett, consumers department, San Joaquin Light & Power Corporation, Fresno, winner of the fourth prize in the slogan contest, was placed beneath the photograph of E. C. Van Buren, of the credit department of the same company, winner of the fifth prize, and Mr. Van Buren's below that of Mr. Hughett.

Utah Power & Light Company Takes Over Small Utility.—Effective Jan. 1, the Utah Power & Light Company has taken over for operation the property of the Clark Electric Company, which formerly had its main office at Tooele, Utah. The territory served by the latter company, in which there are at present about 1,200 customers, includes the towns of Tooele, Stockton, Ophir and Grantsville.

Contractor-Dealers' Association Holds Annual Banquet

One of the most successful affairs ever held by the San Francisco Association of Electrical Contractors and Dealers was the annual banquet which took place on the Roof Garden of the Hotel Whitcomb, San Francisco, Saturday, Jan. 17. Dinner was served at 7 p.m. to 300 in attendance. The committee in charge of arrangements was composed of Gus Baracco, Victor Lemoge, Ed Dowd, Walter Mobley and Dave Carson. The hall was beautifully decorated with electrically lighted Chinese and Japanese lanterns, and with potted plants. The floral decorations on each table added materially to the attractiveness of the general setting.

Throughout the dinner and the entire evening dancing was enjoyed, the music being furnished by an orchestra of exceptional merit. The entertainment committee had provided special features, which included musical and dancing choruses, as well as solo dancing. Favors at the tables included serpentine, paper hats, noise-makers and balloons, as well as cigarettes and cigars. An elaborate six-course dinner was furnished and included fruit cocktail, mock turtle soup, asparagus with mayonnaise, squab and moulded ice cream, followed by black coffee and cigars.

An interesting feature of the evening was the drawing of prizes for the ladies. Each lady present was given a numbered ticket, the duplicate of which was deposited in a box, and at an appointed time drawings were made. Twenty-five merchandise orders on San Francisco firms were presented to the winners.

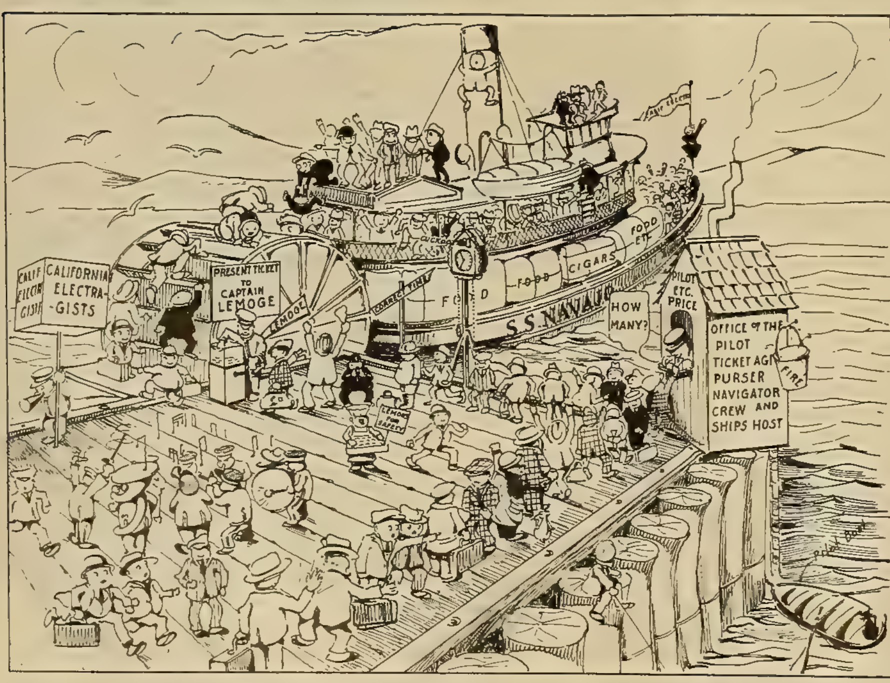
News of the Electragists

California Electragists Quarterly Meeting at Sacramento

The regular quarterly meeting of the California Electragists will be held at Sacramento, Feb. 14, 1925. Those members from the San Francisco Bay territory and others who wish to make the trip to Sacramento by boat will leave San Francisco on the Southern Pacific steamer Navajo at 5:30 p.m. Friday, Feb. 13, and will arrive at Sacramento early the following morning. The return trip will be made leaving Sacramento Saturday, Feb. 14, at 6 p.m., arrival at San Francisco being about 9 a.m. Sunday, Feb. 15.

The round trip fare, including dinner, midnight lunch, breakfast, berth and state room, both ways, will be $12. This does not, however, include meals in Sacramento. Tickets may be secured only from Walter F. Price, executive secretary, California Electragists, 318 New Call Building, San Francisco, and reservations should be made immediately. Mr. Price has made special arrangements with the Southern Pacific Company for the use of the steamer Navajo and has made unusual preparations for a pleasant and enjoyable trip. It is announced that Lawrence W. Davis, general manager of the Association of Electragists, International, will arrive in San Francisco on Feb. 13 in time to make the trip to Sacramento. Inasmuch as Mr. Davis always has a message of deep interest to electragists, it is anticipated that the attendance on this trip will exceed that of any preceding excursion.

The executive committee meeting will be held on Saturday morning at nine o'clock, and at one o'clock Saturday afternoon, Feb. 14, there will be an open meeting. All electragists who can find it possible to get away should endeavor to make this trip.



Artist's conception of the start of the California Electragists' trip to the quarterly convention to be held at Sacramento Feb. 14. To judge from the deckload of freight on the lower deck, Walter Price has well fulfilled his function as ship's host.

Electragists' Manager to Attend California Meeting.—Lawrence W. Davis, general manager of the Association of Electragists, International, is expected to arrive in San Francisco Feb. 13, to attend the quarterly meeting of the California Electragists to be held at Sacramento, Feb. 14.

Book Reviews

SUBSTATION OPERATION

By EDWIN KURTZ. 261 pages, 5½x8 in.; 210 figures. $2.50. Published by McGraw-Hill Book Company, Inc., New York, N. Y.

The intent of this book is to help the practical operator to acquire a knowledge of the principles of electrical machinery and of the approved methods of substation operation. According to the author, the book should help the operator "in his study of station layout and wiring; in acquiring the names of machines and auxiliary apparatus; in learning their functions, . . . in learning how to fill out station records properly; in understanding the purpose of such records." Elementary principles covering the purpose and methods of testing circuits and the use and care of safety equipment, together with the principles of accident prevention are also treated.

The material presented is drawn largely from sources such as the bulletins of the National Electric Light Association, manufacturers' instruction books, and operating booklets of a number of operating companies.

The book is quite elementary and the information is presented in a style easily understood. From time to time the hydraulic analogy is used when explaining the principles of an electrical machine such as the alternating or direct current motor, the transformer, the frequency changer or the rotary converter. The chapters on operation of machines and operating troubles are outstanding. Numerous photographs are presented which assist greatly in outlining the operating procedure. The last chapter is devoted to test questions for substation operators. These questions, compiled from lists of questions submitted by a number of power companies, should add considerably to the value of the book.

To cover such a large and diversified subject as substation operation in a book of this size is almost an impossible task unless the principles and descriptions are given in a very elementary manner. However, in a book of this nature the descriptions of the electrical machines in use in substations are entirely too meager. The book would be of much more value if this portion of it were amplified.

As a further suggestion, the outdoor substation should be included in a future edition. E. R. S.

Meetings

To Hold Better Lighting School in Oakland Feb. 2-13

The better lighting school, to be presented by the lighting educational committee of the Pacific Coast Electrical Association, will start on the evening of Feb. 2 and will be held on alternate afternoons and evenings until and including Feb. 13. The school will be conducted in the auditorium of the Pacific Gas and Electric Company, Oakland, Calif., and will be open to contractor-dealers, power companies and jobbers' salesmen, builders, architects and engineers.

The object of the course is to give those enrolling a knowledge of the essentials of good lighting so that the installations for which they are responsible will be correct from the illumination standpoint. The course has been especially prepared and is a consolidation of those given by the National Lamp Works of Nela Park, Ohio; the Edison Lamp Works at Harrison, N. J.; and the National Electric Light Association.

Five hundred dollars for conducting the school has been supplied by the Pacific Coast Electrical Association. Special demonstrating equipment has been secured to assist the lecturers, and a supply of blank blue prints will be used to allow the students in the course to practice laying out the lighting in various buildings.

Enrollment in the course will be limited to fifty. No tuition fee will be charged, but a deposit of $20 will be required from each registrant. From this deposit $2 will be deducted for each meeting missed; the balance will be returned to the students at the end of the course. The purpose of the charge for failure to attend meetings is to insure full attendance during the entire course.

All of the lectures will be delivered by local men particularly conversant with the various topics. The evening meetings, which will be held Monday, Wednesday and Friday evenings, will start at 7 p. m. and continue until 10 p. m., and the afternoon meetings on Tuesdays and Thursdays will last from 1 to 5 p. m. There will be no Saturday classes. Clark Baker, of the National Lamp Works of the General Electric Company, Oakland, is chairman of the lighting educational committee. He is being assisted by H. H. Allison, Electric Appliance Company, San Francisco, who is vice-chairman.

COMING EVENTS

California Electragists—
Quarterly Meeting—Sacramento, Calif.
Feb. 13-14, 1925

New Mexico Electrical Association —
Annual Convention—Albuquerque, N. M.
Feb. 16-18, 1925

Commercial National Section, N.E.L.A.—
New York, N. Y.
March 17-19, 1925

Southwestern Public Service Association—
Annual Convention—Rice Hotel, Houston, Texas
May 5-8, 1925

Electrical Supply Jobbers' Association—
Annual Convention—Hot Springs, Va.
June 1-6, 1925

Associated Manufacturers of Electrical Supplies—
Annual Meeting—Hot Springs, Va.
June 8-12, 1925

National Electric Light Association—
Annual Convention—San Francisco, Calif.
June 15-19, 1925

Power Resources on Colorado Discussed by Engineer

H. W. Dennis, construction engineer, Southern California Edison Company, Los Angeles, gave the first of a series of four lectures on the Colorado River before the water power, irrigation and agriculture section of the Commonwealth Club of California at San Francisco, Jan. 28. Four lectures on various phases of the Colorado have been arranged for the club members.

Mr. Dennis discussed the problem from the angle of power development, outlining in considerable detail the projects which have been proposed. The lecture was illustrated with lantern slides of photographs taken by Mr. Dennis on a trip down the river in connection with the studies of its power resources that have been made by the Southern California Edison Company.

The second lecture of the series will be held in the rooms of the Commonwealth Club, 345 Sutter street, San Francisco, on Monday evening, Feb. 2. S. C. Evans, mayor of Riverside and executive director of the Boulder Dam Association, will be the speaker. Two other meetings will be announced at a later date.

First Banquet of Pacific Radio Trades Association

The first banquet of the Pacific Radio Trades Association was held at the Roof Garden of the Hotel Whitcomb, San Francisco, Jan. 14, 1925. Dinner was served at 6:30 p.m. and was attended by nearly 200 persons. A. S. Lindstrom, vice-president, presided in the absence of the president. Following committee reports and routine matters, C. C. Langevin introduced Heckert L. Parker, newly appointed executive secretary. Following a few remarks by Mr. Parker, a splendid musical program was furnished, this entertainment being broadcast through station KFRC, the Radioart Studio of San Francisco. Upon completion of the musical program, Don Lippincott, electrical engineer of the Magnavox Company, Oakland, Calif., Arthur H. Halloran, editor and publisher of Radio, and H. L. Parker delivered short addresses.

Pacific Coast Electrical Association

Tentative Program for N.E.L.A. Convention Announced

A tentative program for the annual convention of the National Electric Light Association, to be held in San Francisco June 15-19, has been announced by S. H. Taylor, secretary of the Pacific Coast Electrical Association. The present program calls for four general sessions of the national association and for three meetings each for the Accounting, Commercial, Public Relations and Technical National Sections. The section meetings will be held simultaneously.

The Public Policy National Section will hold an open meeting on the evening of June 17. Details concerning the program of the meeting, which will be of interest to the entire industry and the public, will be announced later.

The president's reception will be held on the evening of June 15 and will be at the Fairmont Hotel. All other meetings will be in the San Francisco Civic Auditorium. The evening of June 18 will be devoted to entertainment. The convention will adjourn after a general session on the morning of June 19.

The annual meeting of the Pacific Coast Electrical Association will be held on the morning and afternoon of June 15. This will be the only time that will be devoted exclusively to the Pacific Coast organization's work.

Trips to power developments in the vicinity of San Francisco are being arranged for delegates to the convention. Definite announcement concerning the excursions available to the visitors will be made at a later date.

F. A. Leach, Jr., president of the Pacific Coast Electrical Association and vice-chairman of the general convention committee, has announced the appointment of the following executive committee chosen from the committee members published in the Jan. 15, 1925, issue of the Journal of Electricity, page 68:

F. A. Leach, Jr., chairman
Wm. Baurhyte, vice-chairman
S. H. Taylor, secretary

R. M. Alvord	C. T. Hutchinson
T. E. Bibbins	A. Jackson Marshall
J. B. Black	F. S. Myrtle
Henry Bostwick	J. F. Pollard
P. M. Downing	M. W. Scanlon
R. E. Fisher	E. O. Shreve
C. E. Heise	W. G. Vincent, Jr.

S. Waldo Coleman, president Coast Counties Gas & Electric Company, has been added to the general convention committee by Mr. Leach.

COMING PACIFIC COAST ELECTRICAL ASSOCIATION MEETINGS

Purchasing and Stores Section—
San Joaquin Light & Power Building, Fresno, Calif.
Feb. 10-11, 1925

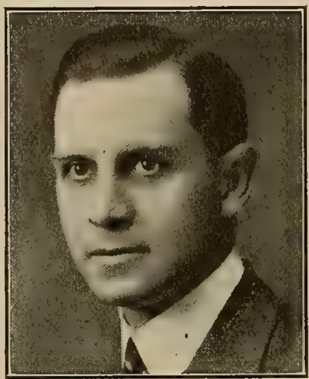
Technical Section—
Conclave and Executive Meeting—San Joaquin Light & Power Building, Fresno, Calif.
March 25-27, 1925

Commercial Section—
Conclave and Executive Meeting—San Joaquin Light & Power Building, Fresno, Calif.
April 3-4, 1925

Pacific Coast Electrical Association—
Annual Meeting—San Francisco, Calif.
June 15, 1925

Personals

John E. Loiseau, who since his transfer to Denver late in 1922 has served as secretary of the Public Service Company of Colorado of that city, has been honored by election to the board of directors of the company. Although one of the youngest executives in the Doherty organization, he has held a num-



JOHN E. LOISEAU.

ber of responsible positions, and in the short time he has been in the Mountain region he has made many friends through his activity in the industry. Mr. Loiseau is a native of South Dakota and received his education in the schools of Perryville, Mo., and Quincy, Ill. His first commercial experience was with the Missouri Pacific Railway. Then from the Mt. Vernon Car Manufacturing Company in Illinois about 1915 he entered the employ of the local power company and was later transferred to Mansfield, Ohio, where he served as secretary and treasurer of the Richland Public Service Company and the Ashland Gas & Electric Light Company. In 1920 he was elected secretary of the Montgomery, Ala., Light & Water Power Company and served in that capacity until the property was sold, and he was transferred to his present position in Denver. He is chairman of the accounting section of the Rocky Mountain Division, N.E.L.A., and is an active member of the Rocky Mountain Committee on Public Utility Information. He holds memberships in the Denver Chamber of Commerce, Kiwanis Club, Denver Athletic and Lakewood Country Clubs.

Jay S. Groo, at one time connected with the Northwestern Electric Company, Portland, Ore., and more recently executive secretary of the Home Lighting Campaign committee of that city, has joined the commercial department of the Portland Electric Power Company. He will have charge of the series of kitchen lighting campaigns to be conducted by that company in the near future.

A. Emory Wishon, general manager, San Joaquin Light & Power Corporation, Fresno, Calif., recently spent a short time in San Francisco.

Robert M. Davis, statistical editor of Electrical World, New York City, is making a tour of Pacific Coast states. "The Electrical Industry, Past, Present and Future," forms the basis of the address delivered by Mr. Davis to the organizations before which he is asked to speak.

J. M. Gilchrist, Federal Electric Company, Chicago, Ill., was recently a visitor in San Francisco, Calif.

C. H. Talmage, formerly manager of the Western Electric Company, Salt Lake City, has been appointed sales manager for Brown & Pengilly, Inc., electrical manufacturers and engineers, Los Angeles.

Will T. Neill, superintendent of rates and service, Pacific Power & Light Company, Portland, Ore., has gone to New York to be absent about two weeks on business for his company. Mr. Neill recently returned from a week's business trip to San Francisco, Calif.

Harry V. Mooney, electrical heating engineer of San Francisco, has moved his headquarters to Portland, where he will establish a manufacturing plant under license for the assembly and sale of Wesix electric air and water heaters. Mr. Mooney will operate through the Pacific Northwest and British Columbia.

Ben P. Baily, for many years district manager in different districts of the Pacific Power & Light Company, Portland, Ore., and at present holding that position at Astoria, Ore., has been promoted to be district manager at Yakima, Wash., taking the place of **George C. Sawyer**, transferred to the Portland office as sales manager.

L. M. Klauber, general superintendent, **Carl Wiggins**, superintendent of electric production, and **Wm. Talbott**, superintendent of electric meter department, San Diego Consolidated Gas & Electric Company, San Diego, Calif., have been recent visitors to San Francisco in attendance at various sessions of the P.C.E.A. committees recently.

Frank Gentles, formerly with the Wholesale Electric Company, San Francisco, Calif., has joined the staff of Ed Jones, dealer in wholesale electrical supplies in that city.

Glen L. Corey, district manager at Toppenish, Wash., for the Pacific Power & Light Company, Portland, Ore., has been promoted to be district manager at The Dalles, Ore., succeeding **J. B. Kilmore**, transferred to Astoria, Ore.

F. A. Merrick, formerly vice-president and general manager, Canadian Westinghouse Company, Hamilton, Ontario, has been made vice-president and general manager of the Westinghouse Electric & Manufacturing Company, with headquarters in East Pittsburgh, Pa.

H. C. Goodrich, engineer of the Utah Copper Company, Salt Lake City, Utah, was the principal speaker at a recent meeting of the Utah Society of Engineers.

J. A. Kahn, president, Capital Electric Company, Salt Lake City, Utah, acted as toastmaster at the recent banquet given by that company to its salesmen.

L. A. Freed, Baldwin Radio Company, Salt Lake City, Utah, recently was a visitor in San Francisco, Calif.

George M. Eaton, designer and builder of locomotives and chief electrical engineer of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., recently visited Seattle on a tour of inspection of the Northwest.

H. L. Lamphear, dealer in electrical supplies, Chicago, Ill., recently spent some time in San Francisco, Calif.

Stafford J. King, for the past twelve years sales engineer for the Sangamo Electric Company, Springfield, Ill., has been placed in charge of that company's newly opened sales office in Boston, Mass. **L. G. Hunt**, for the past three years district sales engineer with headquarters at the factory, will be associated with Mr. King in Boston, as will also **W. H. Carpenter** and **R. D. Savage.**

J. B. Kilmore, who has held the position of district manager in different districts of the Pacific Power & Light Company, Portland, Ore., for a number of years, and at present holds that position at The Dalles, Ore., has been promoted to be district manager at Astoria, Ore., taking the place of **Ben P. Baily**, transferred to Yakima, Wash.

Harry L. Williams, manager of the Evanston, Wyo., division of the Utah Power & Light Company, Salt Lake City, Utah, has been appointed a director of the Rocky Mountain Committee on Public Utility Information. This is the third successive year in which Mr. Williams has been one of those selected to serve in this capacity.

R. C. W. Libbey, Intermountain representative of Landers, Frary & Clark, New Britain, Conn., has returned to Salt Lake City, Utah, after attending a sales conference at the factory.

George C. Sawyer, for the past eleven years district manager at Yakima, Wash., for the Pacific Power & Light Company, Portland, Ore., was promoted on Jan. 15, 1925, to the position of sales manager of that company with headquarters at Portland. Mr. Sawyer was born in 1887 in Manchester, N. H., and after completing grammar and high school in that city at the age of seventeen, he entered the General Electric Works at Lynn, Mass., in the electric meter department, where he remained three years. In 1907 he went to the Consolidated Lighting Company, Montpelier, Vt., to work in the meter and

GEORGE C. SAWYER.

commercial departments. In June, 1910, he entered the employ of the Pacific Power & Light Company as meter engineer with headquarters at Walla Walla, Wash. In June, 1913, he was appointed to the position of district manager at Yakima, where he remained until his recent promotion. In his new position he will have charge of matters pertaining to new business of all kinds, principally power sales.

Samuel Kahn, vice-president and general manager of the Western States Gas & Electric Company, Stockton, Calif., was recently appointed one of the directors of the Standard Gas & Electric Company, the holding company under which many of the properties of H. M. Byllesby & Company are controlled. Mr. Kahn was born in San Antonio, Texas. He spent two years at the University of Texas in the study of engineering and then entered Purdue University, graduating in 1903 with the degree of electrical engineer. Until 1909 he was engineer for the San Antonio Gas & Electric Company and the San Antonio Traction

SAMUEL KAHN

Company. He then accepted the general management of the Union Light, Heat & Power Company of Fargo, N. D. In 1911 he became general manager of the Appalachian Power Company of West Virginia and Virginia, and from there entered the Chicago office of the H. M. Byllesby interests. He was transferred to the Tacoma Gas Company at Tacoma, Wash., and a short time later in 1913 was appointed to the position he now holds with the Western States Gas & Electric Company. Under his management the company has maintained a steady growth during the past eleven years. The hydroelectric project on the south fork of the American River, known as the El Dorado development, was begun under his direction. Within the last year the first unit of 20,000 hp. was completed and placed in operation. Upon the acquisition of the Sierra & San Francisco Power Company by the Byllesby interests, Mr. Kahn was selected as vice-president of that company, which is operated under lease by the Pacific Gas and Electric Company. This position he now holds in addition to his managership of the Western States Gas & Electric Company. Mr. Kahn has always been a leader in civic affairs in Stockton. He is chairman of the deep waterways committee of the Chamber of Commerce, of which he has been a director for a number of years, and has been especially active in Stockton's effort to obtain a deep-water channel to the sea.

Robert Miller, district manager, General Electric Company, Denver, Colo., spoke on that company's new radio broadcasting station, KOA, in that city, at the banquet given recently by the Capital Electric Company, Salt Lake City, Utah, to its salesmen.

R. D. Marple, formerly with Leo J. Meyberg Company, San Francisco, has recently joined the Graham-Reynolds Electric Company, Los Angeles, in the capacity of assistant manager of the radio department. Mr. Marple will be assistant to **Stanley W. Benjamin,** who has been placed in charge of that department and will look after the Day-Fan radio line.

John H. Trumbull, president, The Trumbull Electric Manufacturing Company, Plainville, Conn., elected lieutenant-governor, has become governor of Connecticut through the resignation of the governor-elect to become a senator.

H. A. Noble, of the engineering staff of the Byllesby Engineering & Management Corporation, Chicago, Ill., accompanied by Mrs. Noble, is spending two or three months in San Diego, Calif.

S. F. Forbes, Fairbanks, Morse & Company, Los Angeles, recently paid a visit to San Francisco.

J. F. Nibley, Baldwin Radio Company, Salt Lake City, recently was a visitor in San Francisco.

Franklin T. Griffith, president of the Portland Electric Power Company, Portland, Ore., and president of the National Electric Light Association, recently spoke before the Oregon State Chamber of Commerce.

Grover A. Anderson, formerly sales manager, Electric Appliance Company, San Francisco, has been placed in charge of the newly opened San Francisco branch of the J. G. Pomeroy Company of Los Angeles.

Percy Fisher, for some years associated with the Escondido district of the San Diego Consolidated Gas & Electric Company, San Diego, Calif., in technical capacities, has been appointed acting district agent for that district, relieving **Lester A. Wright,** who is recovering from a serious illness.

K. E. Van Kuran, Los Angeles district manager, Westinghouse Electric & Manufacturing Company, recently spent several days in Tucson and Phoenix, Ariz., and El Paso, Texas, visiting the branch offices of that company in those cities.

E. M. Herr, president of the Westinghouse Electric & Manufacturing Company, has changed his headquarters from East Pittsburgh, Pa., to the Westinghouse Building, 150 Broadway, New York.

Victor Lemoge, Ed Dowd, Dave Carson, Gus Baracco and **Walter Mobley** composed the committee in charge of arrangements for the annual banquet of the San Francisco Association of Electrical Contractors and Dealers held recently in that city.

G. H. P. Dellman, Carl Wiggins, Al May, W. A. Cyr and **W. G. Boyce** were elected members of the executive committee of the San Diego Electric Club, San Diego, Calif., at its recent annual meeting.

R. C. Griffin, formerly sales engineer, Pacific Gas and Electric Company, San Francisco, has resigned to become manager of a sand and gravel plant in Los Angeles.

J. W. Ferry, manager Pacific Coast division, Hurley Machine Company, manufacturers of the Thor line of washing machines, vacuum cleaners and ironers, with headquarters in San Francisco, was a recent visitor to Los Angeles and points in southern California in the interests of his company.

L. A. S. Wood, manager of the illuminating department of the Westinghouse Electric & Manufacturing Company, with headquarters in South Bend, Ind., arrived in Los Angeles recently for a visit of several weeks. Mr. Wood for a number of years was with the Westinghouse company, after which time he was manager of the George Cutter Company of South Bend, which was later purchased by the Westinghouse company and Mr. Wood placed in charge. He is considered an authority on industrial and street illumination.

C. J. White, formerly owner and manager of White for Light, Long Beach, Calif., has recently been appointed Pacific Coast representative of the Tork Company, Inc., and the Electric Outlet Company, Inc., of New York. Mr. White will choose either Los Angeles or San Francisco as his headquarters. For the past five years he has had his own store and contracting business in Long Beach.

W. P. Stanton, president, Electrical Workers' Union of San Francisco, Calif., has been nominated for president of the San Francisco Labor Council, his name being the only one presented.

Obituary

Leroy Moore, assistant treasurer of the Pacific Gas and Electric Company, San Francisco, died in Oakland Dec. 29, 1924. Mr. Moore, who had formerly been a banker in Michigan, came to California in the late nineties and in 1898 became affiliated with the Yuba Electric Company. This company, through various consolidations, became a part of the Pacific Gas and Electric

LEROY MOORE

system, and in 1921 Mr. Moore was made assistant treasurer, serving in that capacity until his death.

Glenn Grenville Howe, for many years senior vice-president of the Link-Belt Company, Chicago, Ill., died Dec. 25, 1924, at his home in Muskegon, Mich., after a long illness.

Mrs. Hattie K. Sechrist, president of the Albert Sechrist Manufacturing Company, Denver, died suddenly in that city Jan. 11.

TRADE NOTES

General Electric Company, Schenectady, N. Y., has recently issued Bulletin No. 48732, "Electric Equipment for Cranes." This is an attractive 35-page leaflet, well illustrated with photographs, diagrams, tables and charts. It discusses the subject thoroughly, with particular reference to crane motors and control, brakes, etc. Information is given on operating characteristics, and types of standard motors are listed, together with other valuable data.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has recently perfected a new industrial hearth-type electric furnace for operation up to 1,850 deg. F. This furnace, known as type B, is made with hearth sizes ranging from 4 in. wide and 10¼ in. deep to 12 in. wide and 36 in. deep. One of the many advantages of this type of furnace is its automatic control, which enables the operator to maintain a desired temperature indefinitely.

The Stoker Manufacturers' Association has recently issued "The Condensed Catalog of Mechanical Stokers," a complete catalog of the various competitive manufacturers of mechanical stokers. It is a part of the educational advertising campaign being conducted by the association, and copies may be obtained, without charge, upon request to the secretary, M. V. McAllister, foot of Walker Avenue, Detroit, Mich.

Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has recently developed a type of controller to meet the requirements of uniform periods of acceleration of motors driving auxiliary machines in the steel mill. In this "time-limit" controller the inductive principle is utilized, and the entire construction and all parts are extremely simple.

Harvey Hubbell, Inc., Bridgeport, Conn., announces a new canopy toggle switch adapted for wall fixtures and all kinds of electric apparatus, such as motor-operated phonographs, player actions for pianos, portable electric fans, dictating machines, etc. This switch is small, compact and strong. The toggle mechanism is quick-acting and easily operated. The switch is quickly assembled to the canopy by merely inserting the threaded stem through a hole in the canopy and screwing on the knurled lock washer.

Griscom-Russell Company, New York City, N. Y., has announced the development of a novel design of heat exchanger for oil refinery use. Its pamphlet, Form 201, describes in detail the two models, Twin Multiwhirl and Twin Vaneflo.

The Elwell-Parker Electric Company, Cleveland, Ohio, has issued catalog No. 130, "Elwell-Parker Electric Industrial Trucks and Tractors." Specifications of the different types of trucks and tractors are given in detail, and many illustrations show the numerous uses to which these machines may be put.

Sangamo Electric Company, Springfield, Ill., has issued Bulletin No. 67, "Alternating - current Watthour Meters," describing in detail its Type H model. It is well illustrated.

The Inland Glass Company, Chicago, Ill., has issued a catalog in colors of its lighting fixture glassware. The catalog gives full description of the various units, including decorative glassware and balls, bowls and shades. The line is handled on the Pacific Coast by Moe-Bridges Company, San Francisco, Calif.

The Pacific States Electric Company, with headquarters in San Francisco, Calif., has announced the opening of branch offices and a warehouse at 1317 Orizaba Street, Long Beach, Calif. The new branch will carry full stocks and render prompt service on a full line of standard electrical merchandise.

Louis F. Leurey, past president of the San Francisco Electrical Development League is always "Johnny-on-the-spot" in an emergency, particularly when the emergency has to do with engineering. Here he is shown pumping out the ocean through a fire hose.

Phillips & Somers is the name of a recently organized firm of consulting industrial engineers composed of L. A. Somers, formerly manager of the Coast Equipment Company, and Charles T. Phillips, formerly of Charles T. Phillips & Company, both of San Francisco, Calif. The concern, which specializes in the design of electric wiring, illuminating, heating, ventilating and plumbing systems, steam power plants, steam-electric power plants and electric motor drives, has offices in San Francisco, Oakland and Los Angeles, Calif.

The Domestic Electric Appliance Company, Seattle, Wash., has been appointed distributor for the State of Washington for the Johnson Impeller washer.

Quick's Electric Shop, 4505 South Vermont Avenue, Los Angeles, Calif., formerly conducted by W. L. Selby, has been purchased by H. L. Rubardt, who will operate the business under the same name. In addition to retailing electrical equipment and contracting, Mr. Rubardt will manufacture and stock radio equipment.

Grand Avenue Radio & Electrical Company is the name of a new retail store recently opened at 2218½ South Grand Avenue, Los Angeles, Calif., by P. H. Poore and Donald McDonald. Mr. McDonald is in charge of radio manufacturing and retailing, and Mr. Poore is handling electrical equipment and contracting.

Hygrade Lighting Fixture Company, 4328 Sunset Boulevard, Los Angeles, Calif., is a new establishment opened recently by John A. Cobb, formerly of the sales departments of Forve-Pettibone Company and the Angeles Fixture Company, both of that city. The concern will specialize in manufacture of high-grade lighting fixtures.

Charles A. Eastman, Portland, Ore., has been appointed distributor for the Johnson Impeller washer for the State of Oregon.

Fordco Manufacturing Company, 2821 South Vermont Avenue, Los Angeles, Calif., will specialize in the manufacture of exterior lighting fixtures and lanterns for jobber and dealer trade. The concern has recently been established by E. F. Ford, formerly manager of Novo Manufacturing Company, manufacturers of fixtures, of the same city. An attractive catalog, recently issued, may be had upon request.

The Electric Maid Shop, Yakima, Wash., has taken over the busiiness of the Electric Appliance Company and established Yakima as the distributing point for six adjacent counties for the Automatic washer and the Royal cleaner. R. V. Spencer and F. E. Freeman organized the new firm.

Moe-Bridges Company, Milwaukee, Wis., has issued its catalog No. 25, descriptive of lighting equipment. The catalog is well illustrated in colors and shows the latest numbers of this manufacturer.

The Richard Electric Company, Denver, Colo., is offering a consulting electrical service, especially on wiring and illumination. A downtown store is being maintained at 1823 Welton Street. Sol Naiman, formerly a contractor-dealer in Asheville, N. C., is head of the firm.

Fairbanks, Morse & Company, Chicago, Ill., during the week of Dec. 1, 1924, held a sales conference of its twenty-eight branch managers, together with factory and general office executives, at that city. New products, sales plans and production methods were studied, and inspection trips were made by the entire party to the company's electrical machinery plant at Indianapolis, Ind., the pump factory at Three Rivers, Mich., and the engine plant at Beloit, Wis.

The Standard Electric Stove Company, Toledo, Ohio, has recently issued its Catalog No. 14 covering its lines of electric ranges, ovens, cookers, hot plates, urns, serving tables, griddles and water heaters. A large number of Standard ranges has been installed in Western apartment houses recently.

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February 15, 1925
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Journal of Electricity

Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES

Journal of Electricity entered as second class matter February 17, 1921, at the post office at San Francisco, under the Act of Congress, March 3, 1879.
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Promoting the Widest Use of Electricity

THE extent to which Western central stations utilize the Journal of Electricity in their daily business affairs is typified by the following letter which has been received from the commercial manager of one of the large electric service companies:

> To the Range Salesmen:
>
> Under separate cover we are sending you a copy of the Jan. 15, 1925, issue of the Journal of Electricity. On page 65 you will find a description of an all-electric apartment house in Sacramento, Calif. This article should be of great value to you in assisting you to land apartment-house prospects, and we would suggest that you carry it with you as a regular part of your sales material.
>
> Range Sales Manager.

At all times the Journal of Electricity strives to publish material which will be of use to all branches of the electrical industry in their daily business life. Special efforts have been made through its columns to foster and promote electric cooking, water heating and air heating. The above letter is one example of just how well the magazine is succeeding in its efforts. By utilizing the material presented from issue to issue in the Journal all branches of the industry have at their command a strong sales help.

EDITORIAL

Closer Understanding Between Various Departments Is Needed

A lineman in one of our southern companies, after years of faithful and conscientious service, was promoted to the position of district agent for an outpost of the company for which he worked. Circumstances leading up to this promotion are not immediately important. For some years prior to the advancement this chap worked in his district as its jack-of-all-trades, attending personally to a multitude of tasks, carrying in his mind a knowledge of the entire system and serving in many diverse ways, morning, noon and many nights.

Yet his attitude remained essentially that of a lineman, which is to say, that of a craftsman. There were times when he might have been a bit uncomprehending of the demands made upon his craft by that group of fellow-workers known as the commercial department. There were times when the compromises asked of him in the interests of serving a customer who found it difficult to meet the necessary financial conditions, such as advance construction deposits, were not justified, in his opinion, and a let-down from the highest standards of practice in construction was never to be tolerated.

But since his has become the task, not only of planning the extension, but of selling as well, there has come to this craftsman a new angle of view. He has come to realize the relation between the financial consideration and the job, something he did not have to deal with formerly, and also he has gained an insight into the customer's peculiar difficulties which he had not needed to reckon with, particularly, before. Occasionally now, in matters of construction in which in former days, as a member of the engineering staff, he would have demanded the utmost in standards, he gets into a discussion with members of such departments, in which he is likely to say:

"Say, all you fellows can see here is a pretty line, with every insulator just so and every pole lined up with the north star, but by gosh, we fellows have to figure out how a farmer can get juice, even if we have to string the wires to him on fence posts."

This is not intended as a plea for the deterioration of standards as regards the most approved practices of construction,—far from it. It is true that construction can become an end in itself, instead of being a means toward that end. Occasionally there may be a tendency in this direction. Nevertheless, the best has proved cheapest in so many cases that it would be foolish, if not dangerous, or at least stupid, to advocate any lowering of construction standards.

There is room, however, for undstanding between construction, engineering, and similar departments, and those which have to deal more directly with the public—the commercial and even the securities departments of public utilities. Nothing will bridge this gap more effectively than a little experience gained in the respective fields of different departments by members of other departments.

It might almost be worth the trouble to see to it that every line foreman, at least, has a few weeks experience in the sales departments; and vice versa, every salesman a week or two in a line crew. In such circumstances neither would ask of the other what he had seen from actual observation to be rather impossible, and each would be more appreciative of the limitations of the other in his appointed work.

"Cheap" Appliances Are a Serious Menace

CONSIDERABLE apprehension has been expressed regarding campaigns which have been staged by the baking interests in various Pacific Coast cities in which cheap electric toasters have been featured. In one city nearly ten thousand of these appliances, in this instance of the "five and ten-cent store" variety, were sold in a single campaign.

The industry has reason to be apprehensive regarding the quality of these devices. They are substandard, and, like similar appliances which have been imported from Japan and Germany, they are unsafe. Devices of this character constitute a menace which the industry, for the most part, has been prone to overlook.

However, in the case of the toasters, some of the fears are unfounded. Is it not possible that the purchaser of the device, after using the electric appliance a dozen or so times and becoming acquainted with its convenience, will go to an electric dealer and purchase a standard appliance, when the cheap toaster burns out as it ultimately will? Chances are that the cheap device will perform an educational function from two different standpoints. In the first place, it will teach the purchaser to make toast electrically, and in the second place, it will give him some valuable experience in the folly of purchasing substandard appliances.

Most of the difficulty in these cases could be obviated if the industry would approach the baking interests with a cooperative plan, as has been done in

other cities, offering a special price concession on standard appliances for the opportunity of tying-in with the baking company's advertising. In any case, sincere efforts should be made to protect both the industry and the public from the dangers of cheap appliances which have flooded the market during the past year.

Orchard Spray—a New Field for the Electric Motor

AMONG the first of the results of the cooperative survey and study of the application of electricity on the farms of California which is being made by the committee on the relation of electricity to agriculture is the study on orchard spraying that appears on another page of this issue. In this article the authors outline a new field of application for the electric motor, a field of many possibilities for manufacturer and power company alike.

The writers of this article estimate that the total installed capacity of the orchard-spraying equipment on the fruit ranches of the state is approximately 30,000 hp., largely in gas engines of capacities ranging from 3 to 10 hp. each. They also estimate that the annual energy consumption of the spray outfits is approximately 10,000,000 hp-hr.

With the facts which are set forth in this article as a basis, manufacturers and electric service companies are in a position to make a further study of this subject with the idea of determining the exact extent of the possibilities in this field. Certainly it is a promising one, even if only a fraction of the present installations can be changed over to electric motor drive.

This one contribution of the committee is well worth the investment which the power companies have made toward the support of the movement. But the work has just started. We confidently predict that before the committee has completed its studies many profitable suggestions will have been made and many new fields of application uncovered. In addition to this, there will be a better understanding between the electric service companies and the farmers of their mutual problems.

And Now Electra in the Role of Iceman

DOMESTIC electric refrigeration promises to be one of the most important phases of the commercial programs of Western central stations during 1925. During the past few years so marked have been the developments and refinements in electric refrigerators that today the manufacturers of these devices are offering the electric service companies a standard appliance, reasonable in price, free from the complaints of the past and nationally advertised. It remains for the electric service companies to fit this appliance into their merchandising programs and place it on the same plane as the electric range.

Certainly domestic refrigeration is an attractive load. The capacity of the individual unit is so small as to require no additional investment on the power company's part for service. At the same time it is practically a 24-hour load so that the total monthly consumption of the individual customer is greatly increased. It is estimated that the average annual revenue from a refrigerator is from \$30 to \$40. Service costs on machines of the latest type promise to be extremely low.

From the standpoint of the customer, electric refrigeration offers many advantages. It is economical, the cost for energy being as low if not lower than ice. It is much cleaner than ice. It is more convenient. It has been proved that food placed in an electric refrigerator keeps better than in the ordinary type of ice box. Certainly the appliance has many sales arguments.

The West has the reputation of having the greatest degree of saturation of appliances of any other section of the country. There is no reason why the electric refrigerator should not have a place in the electrically equipped homes of the West equally as important as that of the electric range. With the power companies rests the task of adding the duty of iceman to the many duties which Electra now performs in the modern home.

Periodic Inspection of Domestic Appliances

SERVICING of the major domestic electrical appliances such as the range, refrigerator and some others, is logically recognized as a function of the central station. At the present time, however, this servicing is done only after a breakdown. Would it not be better to provide periodic inspection in order that the appliances be kept in good order and interruptions resulting from breakdowns eliminated insofar as possible?

Regular inspections could be made at definite intervals and could consist of an investigation of common sources of trouble toward the end that minor adjustments might remove the need for expensive repairs at some later date. Because the men comprising the inspection force would be more than mere inspectors, they should be fitting representatives of the company they represent. Their ability to meet the public should be the deciding factor in their selection.

The gain to the company sponsoring the inspection service might not be traceable in dollars and cents, but the investment would be returned many fold. By providing the most efficient service possible from the electrical devices in a housewife's home the company stimulates their further use and at the same time creates inestimable good will. The prospective purchaser of a range, water heater or refrigerator, knowing that a periodic inspection of these appliances would be made by the electric service company, would be more prone to buy. Then the inspector would also combine the qualities of a salesman with those of the electric service man. While making his visits to the home it would be a simple thing to determine the types of appliances in the home and suggest others. The need for convenience outlets, modern fixtures and wiring might be suggested by the inspector and prospects thus secured turned over to local contractors.

At first thought the expense of this inspection service might appear high. On the other hand, the return over a period of years would offset the money spent. The majority of the public is bound to appreciate the value of such service. The elimination of minor troubles in the electrical appliances in the home will increase its efficiency and use and add to the number of well-satisfied customers.

Service Suggestions Stimulate Interest of Employees

SERVICE to the consumer is the keynote of the successful public utility. Improvements to service reflect themselves in more cordial relations between producer and consumer, and this in turn is bound to be reflected in prosperity for the company.

Electric service companies in general would do well to follow the lead of several of the transportation companies and some few of the electric utilities in encouraging greater cooperation from employees. Inspectors and those officially charged with the task of looking up small details which will result in more complete and satisfactory service being rendered are comparatively few in number, and necessarily so. Further, these individuals are usually overburdened and of course cannot keep in contact with everything at once. The so-called rank and file of general employees, on the other hand, always are in intimate contact with their particular branch and familiar with its shortcomings as well as its commendable features.

Monthly award of cash prizes of nominal amounts for the best and most practical suggestions for service improvements turned in by employees on the job serves two purposes. Not only does it result in bringing to the proper notice the valuable suggestions themselves, but also it stimulates each person toward taking a more personal interest in the work at hand. Several organizations have adopted this system and are finding that is paying dividends.

Fair Competition Brings a Howl from the Jingoes

CALIFORNIA'S Jingo press is raising a howl of protest over the proposed Powers-Hartranft constitutional amendment which the legislature of that state has been asked to approve for submission to the people at the next election. The measure, which would tax publicly owned utilities in the same manner as privately operated properties, reads as follows:

"All property, works, plant and equipment owned, operated, managed or controlled by any city, city and county, county, district or other public agency, created and existing under and by virtue of the constitution and laws of this state, and held or used for supplying the public with light, power, heat, transportation or telephone service, shall be assessed and taxed in the same manner, to the same extent, and for the same purposes, as like properties held or used for like purposes by private corporations and natural persons are assessed and taxed under authority of this constitution and laws enacted pursuant thereto."

Opponents of this bill argue that it should not be passed because it would place publicly owned plants on an identical basis with private properties. They also argue that it would mean one government's taxing another. Both reasons are superficial. The fact of the matter is that the proposed amendment is sound and just. At present every government-owned utility, because it is tax exempt, is being subsidized by money extracted by other forms of taxation from the public's pockets. Refusal to permit taxation of such properties is a confession of weakness on the part of municipal-ownership proponents. For, if government ownership is a heaven-sent blessing as they would have one believe, why are its backers opposed to fair competition with private enterprises?

This Is an Age of Progress

THERE has just come to the editor's desk an advertisement from a Canadian newspaper in which is advertised an air route from the end of a railroad in one of the provinces to a new mining district. The copy-writer in extolling the virtues of this new form of transportation says, "Out with the old, on with the new. From Larder City to Lake Fortune in twenty-five minutes. The comforts of a Pullman car at a speed of 120 miles per hour in the new Laurentide limousines. Enclosed cabin, six-seater, heated and nicely upholstered."

Twenty-five years ago such passenger service would have been considered impossible. But then twenty-five years ago there was no radio, horses did the work done by automobiles, and the electrical industry was but an infant. Truly we live in an age of progress.

DISCUSSION

Future of Cooperative Campaign Depends Upon Present Stand of Industry

To the Editor:

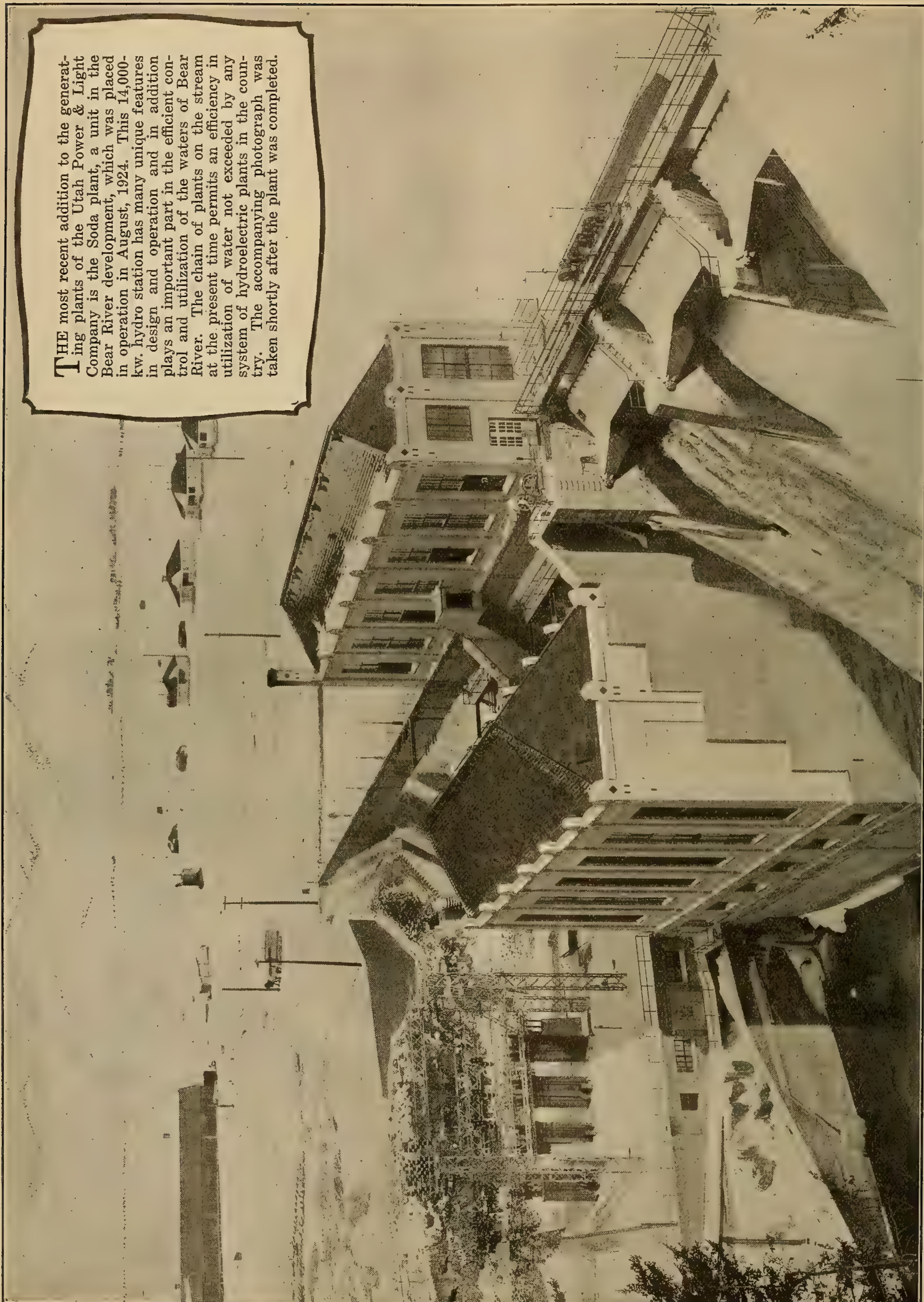
Sir: Your editorial in the January 15 issue of the Journal of Electricity, in regard to the California Electrical Cooperative Campaign, was read with keen interest and is deeply appreciated by me personally.

Truly the Cooperative Campaign is "up for consideration," and I believe its whole future depends upon the stand that is taken at this time. I am sure this editorial will do much to bring the electrical industry to the realization of the function of the Campaign and its possibilities, so that the whole country may continue to turn to California for leadership.

Please accept my most sincere commendation on this editorial and my best wishes for the continued success of your effective Journal.

R. E. FISHER,
Vice-President in Charge of
Public Relations and Sales.
Pacific Gas and Electric Company.

San Francisco, Calif.,
January 24, 1925.



THE most recent addition to the generating plants of the Utah Power & Light Company is the Soda plant, a unit in the Bear River development, which was placed in operation in August, 1924. This 14,000-kw. hydro station has many unique features in design and operation and in addition plays an important part in the efficient control and utilization of the waters of Bear River. The chain of plants on the stream at the present time permits an efficiency in utilization of water not exceeded by any system of hydroelectric plants in the country. The accompanying photograph was taken shortly after the plant was completed.

Details of the Soda Development of the Utah Power & Light Company

By L. B. Fuller

Construction Engineer, Utah Power & Light Company, Salt Lake City

DURING December, 1924, the Utah Power & Light Company placed in operation its 14,000-kw. Soda Plant on the Bear River. In addition to having many unique features in construction and operation, this station plays an important part in the entire Bear River development which now has a high degree of efficiency in utilization of water resources not exceeded by any system of water power plants. In this article Mr. Fuller describes the construction of the new plant and some of its operating features.

THE Soda development, completed during December, 1924, is the most recent addition to the large group of power-generating stations owned and operated by the Utah Power & Light Company. This new two-unit plant, with an installed capacity of 14,000 kw., brings the total installed capacity to 182,000 kw., somewhat over half of which is concentrated in a series of plants on Bear River. The Soda station is the fifth of the series and is located upstream from the older plants at a point 130 miles almost due north from Salt Lake City. Soda Point, from which it takes its name, is a mass of precipitous ledges forming the terminus of a northerly spur of the Wasatch Mountains and is a landmark of the old Oregon Trail.

From an engineering standpoint, perhaps the most interesting feature of the plant is the overhung-generator arrangement of the main units. The vertical main shaft with generator above and waterwheel below is not unusual, but the familiar water-lubricated lignum vitae turbine guide bearing has been omitted, and instead there is an oil lubricated babbitted bearing just above the turbine head cover. Immediately below the rotor of the generator there is a water-cooled Kingsbury thrust bearing resting on a four-armed thrust and guide bearing bracket carried by the circular walls of the wheel pit. The generator guide bearing is immediately below the thrust bearing. The turbine runner and generator rotor are both overhung, thus eliminating bearings above the generator stator and incidentally avoiding deterioration of generator insulation due to oil leakage which invariably takes place when bearings are located on top of the unit.

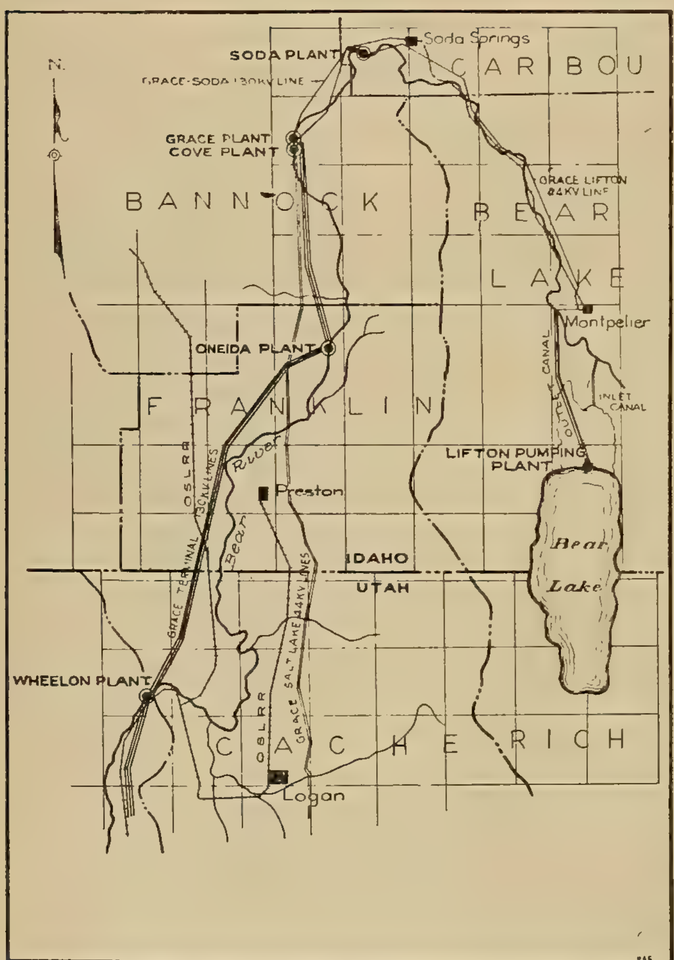
Ventilation is provided through perforations in the generator cover, and heated air is conveyed away by a plate-steel duct surrounding the generator and leading to the building exterior. Suitable dampers permit using the warm air for heating the station when desired. The rotor carries a diaphragm which prevents air going into the generator from the wheel pit. An advantage of this arrangement, which should not be overlooked, is the facility with which the rotor may be removed to permit cleaning or repairs to the generator. By simply removing the generator cover and detaching the rotor hub from the shaft, the rotor may be lifted out leaving all bearings and piping connections undisturbed.

The relation of the Soda plant to the Grace and Cove plants, which are located a few miles down stream, is an important feature of the development, and therefore it will be well to give a brief description of Bear River as now developed and utilized for production of electric energy. This remarkable river, which for a decade has been the principal source of power for industries of the Great Basin district, has its source on the northern slopes of the Uintah Mountains, at a point 60 miles due east from Salt Lake City. Following closely the west boundary of Wyoming it flows north 100 miles; thence pursuing a northwesterly course it enters the state of Idaho. At Montpelier, Idaho, it approaches the vicinity of Bear Lake, with which it has been connected for storage and regulation by two large canals. From Montpelier it continues still northwesterly about 35 miles to Soda Point. Here it reaches the northernmost point of its course and in fact touches the very edge of the Great Basin drainage area. Skirting the cliffs of Soda Point it angles sharply and flows south with occasional short westerly deflections. From Soda Point to the mouth on Bear River Bay of Great Salt Lake the distance is 80 miles. It is on this portion of the river that all the valuable power sites are located.

A few miles below the Soda plant, where the river formerly plunged into Black Canyon, a gorge 500 ft. deep cut in dense basaltic rock, the Grace dam now diverts the river into pipe lines by which it is conveyed 5 miles to a 44,000-kw. plant. The Cove diversion dam picks up the water again from the tailrace at Grace and by means of a 6,000-ft. flume it is made to generate 7,500 kw. at Cove. Neither the Cove nor the Grace plants have extensive storage. An open valley 25 miles in length intervenes between the Cove plant and Oneida Canyon. This canyon is 12 miles long, and at the midpoint is situated a 30,000-kw. installation. The Oneida dam is 125 ft. high and forms a reservoir of ample capacity. The

river next traverses Cache Valley and enters Bear River Canyon, a short precipitous gorge, which forms the site of the Wheelon plant of 7,500-kw. capacity, the oldest plant of the Bear River system.

Great as were the natural resources of Bear River as a source of water power, its value has been enormously increased by extensive development of storage facilities. No less than twenty years ago steps were taken by predecessor companies to divert the flood waters of the river into Bear Lake, but it was not until about 1916, after the construction of the Lifton pumping plant and the completion of the present large inlet and outlet canals, that the effect of annual and seasonal fluctuations was practically eliminated.



Map of the Bear River development of the Utah Power & Light Company showing the locations of the various hydro plants and Bear Lake.

The power streams, however, of the Intermountain region are not only subject to the variations due to increase and decrease of precipitation from year to year and to seasonal fluctuations, but are also extensively affected as to their constancy at any individual power-site location by local weather conditions. During winter months the choking of channels by anchor ice, which forms with great rapidity due to sudden low temperatures in the high plateau and mountain regions, often has severe localized effects. On the other hand, sudden raising of temperatures often has localized effects of increasing stream flow by melting of snow and ice, which, in the absence of distributed storage facilities along the length of developed portions of the streams, result in a net loss of the annual available power.

Nature has fixed the location of the large and important plant at Grace, the most important in fact of the entire Bear River system, at a distance of 50 miles by river and canal from the Bear Lake reservoir and thereby subjected it to some short-duration disturbances in the constant flow it would have had if the intervening waterway could have been eliminated. The Cove plant was similarly situated in this respect, while on the other hand the Oneida and Wheelon plants had the advantage of the large regulating reservoir at Oneida.

At present, however, with the great Bear Lake reservoir at the head of the system to absorb annual and seasonal fluctuations and the Soda and Oneida reservoirs to absorb fluctuations due to weather effects along the course of the river as well as to provide for daily load fluctuations, the system reaches a high degree of efficiency in utilization of water resources and attains an adaptability to service requirements probably not exceeded by any system of water-power plants. The Soda development must therefore be regarded not only as an important addition to power-plant capacity, but as a reservoir project the construction of which has been one of the final steps in perfecting the reliability and constancy of Bear River power.

Construction Items

Excavation at the Soda site began July 1, 1923, and the first unit was placed in operation Aug. 1, 1924. The plant is located in a grazing and agricultural district so that it was necessary to provide housing and boarding facilities for practically the entire construction force as well as buildings for shops, offices and storage of materials. This undertaking involved the construction of 75 temporary buildings from the size of mere cottages and bunk houses to buildings having 8,000 sq. ft. floor space, and was carried out along with the assembly of construction-plant facilities and equipment in the spring months of 1923. One mile of standard gage railroad construction was necessary to bring freight into the camp. A 10-ton cableway was used to span the gorge at the dam location for handling and placing derricks, engines, pumps, etc., as well as structural steel and heavy materials.

The excavation and embankment work at the plant and about the reservoir amounted to more than 150,000 cu. yd., a large portion of which had to do with relocation of roads made necessary by the flooding of former road locations. Five hundred tons of reinforcing steel and 700 tons of structural steel were used. Sixty thousand cu. yd. of concrete aggregates were required. No materials which can be used in the natural state for concrete exist in the vicinity. The rock at the site is not satisfactory for concrete, and all deposits of sand and gravel require treatment of some sort. Eighty per cent of the aggregates was transported 20 miles by railroad, and the remainder was brought from a distance of 45 miles. A crushing, screening, washing and storage plant was erected on the works capable of treating

500 cu. yd. per day. Storage to the extent of 15,000 cu. yd. of aggregates and 6,000 bbl. of cement was at times maintained to insure against delays due to car shortage and transportation difficulties.

Aggregates were conveyed to the mixing plant by 1½-yd. side-dump cars of 3-ft. gage. A heavily timbered twin tunnel was constructed under the stock piles, one compartment being used for the return of empty cars. Precise measurement of sand and coarse aggregates was accomplished by batchers hung in the roof of the loading tunnel. The aggregate cars dumped directly into the charging hoppers of two 28-cu. ft. non-tilting mixers set at an elevation of about 20 ft. above the highest part of the dam. Primary distribution of mixed concrete was by 2-yd. side-dump steel cars propelled by gasoline locomotives. Secondary distribution was by hoppers feeding line chutes and counterweight chutes. The long, severe winter of this locality with temperatures at times reaching — 30 deg. F., hampered the concrete construction work and necessitated temporary housings of great extent as well as heating of all concrete materials.

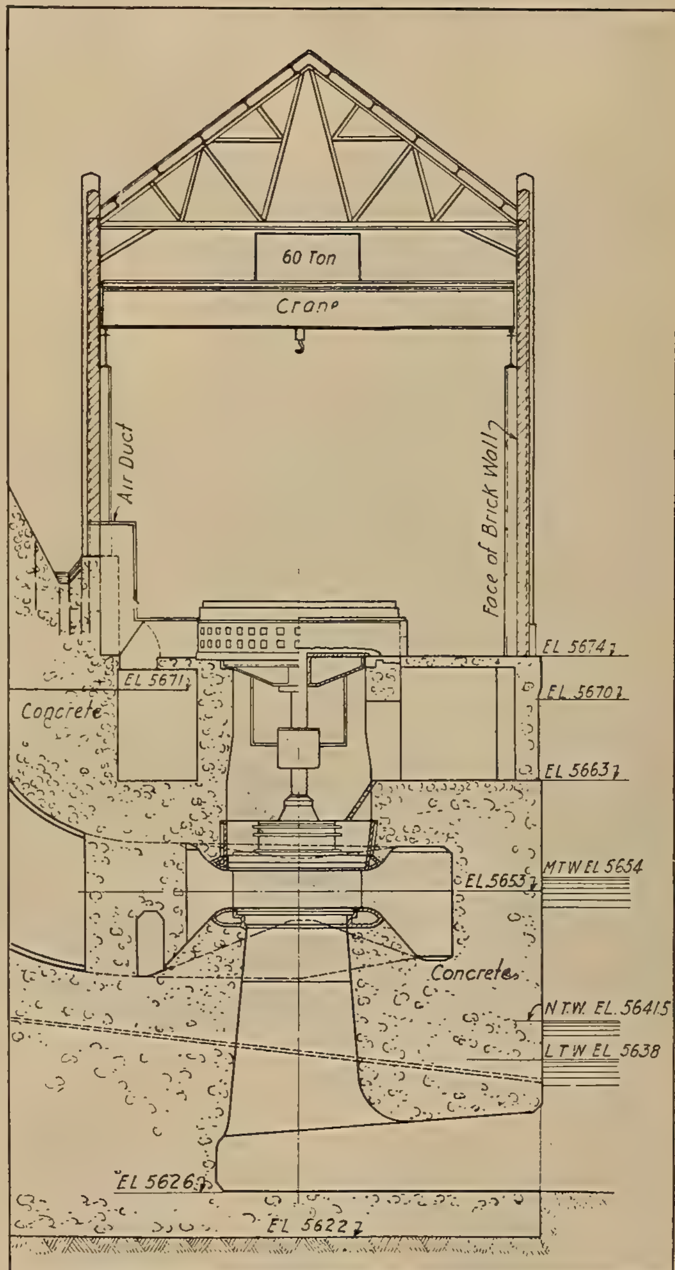
The unwatering was accomplished by diverting the river into a large wooden flume 26 ft. wide by 8 ft. high. After the foundations had been completed from the north bank to considerably past midstream, the river was diverted into sluices left in the concrete for the purpose. The diverting flume was removed and the remainder of the foundations placed. Unwatering operations were difficult because of the great fluctuation of water level caused by ice jams during the winter months that at times raised the water 15 ft. or more and to a height of 35 ft. above the deep foundations.

General Arrangement

The general design of the Soda plant is one of great simplicity and compactness. The entire assembly of structures, including dam, intake, generating station, transformer yard and tailrace are located upon an area 530 ft. long and 200 ft. wide. The dam, which cuts squarely across the gorge, is of the gravity type and of solid concrete construction except at the south end where an earth embankment is used. The foundation for the concrete portion is solid rock, which in midstream is at El. 5,620. The total length is 530 ft. with a maximum height of 105 ft. The crest of the dam is at El. 5,725, while the reservoir surface is 5 ft. lower. Extending upstream 6.5 miles, the reservoir covers an area of 1,200 acres and affords a storage capacity of 16,000 acre-ft. From maximum reservoir surface to elevation of tail water the fall is 80 ft., but under normal operating conditions the reservoir will usually be kept 2.5 ft. lower so that the operating head will be 77 ft.

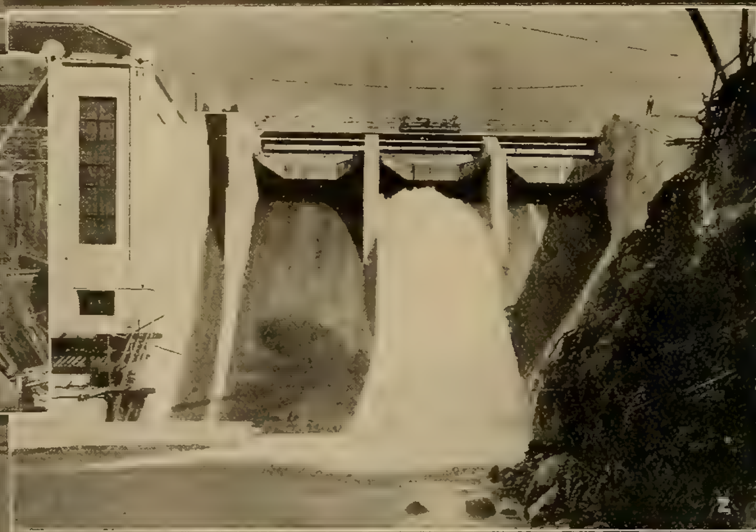
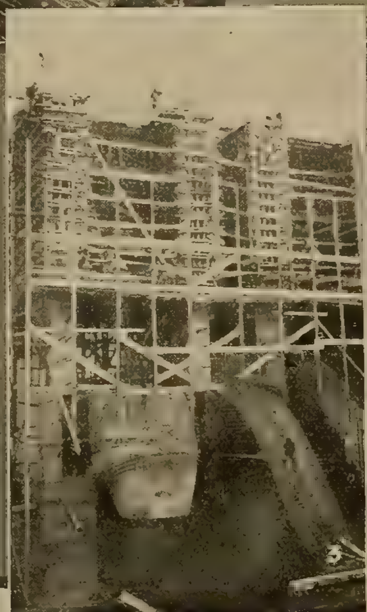
Features of Dam

Beginning at the extreme north end, the first section is 243 ft. long. The top width is 10 ft. The upstream face is vertical, and the downstream face is vertical for 10 ft. with a batter of 6⅜ to 12 below. The maximum height in this portion is 70 ft. The power-house section of the dam is of similar cross-section but of more liberal dimensions to compensate for the large waterways extending through it. This section is 109 ft. long and extends considerably past midstream. The spillway section is 114 ft. long and extends from the power-house section to the abutment walls on the south bank. The section is of the usual ogee shape with curved crest and concave bucket or apron at the toe. From the abutment walls to the junction with the hillside there is a broad embankment of puddled earth 67 ft. long. An inspection gallery 4 ft. wide and 7 ft. high accessible from manholes in the power house foundations ex-



Cross-section of the power house section of the dam showing generator and turbine.

tends throughout the portion of the dam where the height is 50 ft. or more. This gallery is within 5 ft. of the upstream face and vertical 4-in. pipes on 25-ft. centers extend down to bedrock where they connect with vertical holes drilled 25 ft. deep in the rock. Seepage water is thus collected and drained away to avoid hydraulic pressure under the dam.

THE Soda plant was completed in thirteen months from the time active construction started. The accompanying views show some of the construction details. Top left shows the form for the draft tube of one unit being lowered into place. Above at the right is a view of the spillway section of the dam. At the left is a view showing construction work on the dam with a portion of the forms for one penstock in place. Lower left shows construction of the power house section of the dam. Lower right shows the provision made for the storage of aggregates. Because the rock in the immediate vicinity of the plant was not suitable for concrete, much of the aggregate was hauled from distances ranging from 20 to 45 miles and elaborate facilities had to be provided for handling and storing the rock. In addition to a crushing, screening and washing plant handling 500 cu. yd. of aggregates a day, storage was provided for 15,000 cu. yd. and 6,000 bbl. of cement.


The spillway has an effective length of 96 ft., divided into four openings by reinforced concrete piers. The piers support a bridge and form the anchorages and jambs for the large Tainter gates on the spill-crest. The sill of the spillway gates is 12.5 ft. below maximum reservoir level, and each of the three main openings is 30 ft. in width. An auxiliary opening 6 ft. wide equipped with a dropgate is provided for a trash and ice spill. A portable double-drum electrically driven hoist is provided for raising the gates, each gate being provided with hoisting chains which can be quickly attached to the drums as the hoist is propelled along the track on the bridge by means of a hand-driven propelling gear. The ice gate is operated by means of a stationary double-drum hoist also electrically driven. Air pipes embedded in the crest of the dam provide a supply of compressed air to prevent ice formation in front of the gates.

Intake

On the upstream face of the dam seven vertical piers or walls 5 ft. thick and 15 ft. wide in a direction parallel to the stream extend from bedrock to the top of the dam. These piers form the sidewalls of the intake passages. They carry at El. 5,670, a heavy concrete slab which forms the floor of the intake. At the top they carry another slab which is the floor of the gatehouse. The walls are so spaced as to guide the water directly into the passages molded through the dam that connect with the turbines. The passages or penstocks are 12 ft. in height, and each main turbine is fed by two penstocks, one 16 ft. wide and the other 8 ft. wide, both being of rectangular cross-section. There is also in the intake

a 12 x 16-ft. passage leading to a discharge valve with a branch waterway for the exciter turbine. There are five electrically operated sluice gates, two of which are 8 ft. x 12 ft. and three 16 ft. x 12 ft. The gates are mounted on steel rollers working in steel-lined slots in the intake walls. Each gate has two screw-threaded stems 42 ft. in length. All intake openings are protected by movable bar screens, and these have a compressed air system for cleaning. The gate house is 117 ft. long x 30 ft. wide and 37 ft. high. It has a structural steel frame with walls of terra cotta tile covered on the outside with Portland cement plaster, the finishing coat being pure white. The roof slab is of nailing concrete covered with copper shingles finished in a mottled green color. The building has a 10-ton crane equipped with an electric hoist.

Power Station

The substructure of the power station is integral with the dam. In it are molded the draft tubes and scroll cases of the turbines. The substructure contains the first and second floors. The third floor is at the top of the substructure at El. 5,674. The first floor is of small extent between the turbines and used solely for governor oil tanks. The second floor, the most important in the station, is at El. 5,663. On this floor are located the operating room, switchboard, control apparatus and most of the auxiliary equipment. On the third floor the generators, bus-structure and station-service transformers are located. The superstructure is 109 ft. long, 40 ft. wide and 44 ft. to the cave. The construction is similar to the intake house, the walls being finished in white cement with green copper roof. Sliding steel sash windows are used, and at the north end a large Kinnear door permits the transformers to be brought in for attention and repairs. A boiler plant housed in a concrete compartment under the switchyard furnishes steam for station heating and various uses about the dam and intake.

Equipment

The Soda station has two main units and two exciter units. There is also a 62-in. Type "N" Johnson hydraulic regulator used for maintaining a flow for downstream stations at times when the main units are not running and the spillway is not in use. There are four single-phase transformers (one a spare) of 5,000-kw. capacity each for stepping up

Third floor of the power house showing generators and method of housing. At the right are the air ducts for cooling the generators.

from generator voltage to the transmission line voltage, which is 132 kv. A four-panel bench-board of familiar type is provided for control of the main generator and transformer circuits. The auxiliary apparatus includes service water and fire pumps, air compressors, storage battery, etc. No central lubrication system is provided since all important bearings have self-contained circulating pumps and reservoirs. A 60-ton electrically operated Whiting crane with a 10-ton auxiliary hoist spans the clear width of the power house.

The two main turbines of 10,000-hp. capacity each were supplied by the Allis-Chalmers Manufacturing Company. They are designed to run at 150 r.p.m. and to give good efficiencies over a wide range of operating heads. The governor heads are carried by the turbine main shafts. Each governor has its own rotary pump and accumulator tank, which are cross-connected for convenience in making repairs. The 7,000-kw. 6,600-volt generators were furnished by the General Electric Company, as were also the 200-kw. 250-volt exciters, one of which is driven by an induction motor and the other by a 260-hp. 500-r.p.m. steel spiral-cased water wheel supplied by S. Morgan Smith Company. This turbine has a belt-driven Woodward Type HR governor.

In very few hydroelectric plants has centralization of control and general convenience of operation been so completely carried out and perfected as in the Soda station. The operator can, without taking more than two or three steps from his regular station before the switchboard, open and close intake gates, start and stop the units or place the large outflow valve in operation. From a point in front of the benchboard he can observe temperatures of bearings, generator windings and even the power transformers in the switchyard. He can read at a glance the elevations of water in the reservoir, tailrace and at the rear of the intake screens. The position of each important gate and valve as well as the opening of the turbine wickets is indicated in the control room. Periodical inspections of the auxiliary apparatus, operation of disconnecting switches in the bus structure, or at the high-voltage transmission line terminal, are the only ordinary operating steps to require his absence from the switchboard room. Except for accident or unusual condition of some sort, the single switchboard operator requires no assistance in the operation of the entire plant.

Switchyard

The switchyard is located just west of the power station. The arrangement is compact and simple, consisting of a foundation for the transformers and a single bay steel switching structure. The only high voltage switching facility provided is a gang-operated air-break switch, diconnecting the one outgoing line from the transformers. The structure has been so designed, however, that a second outgoing line may be added and a high voltage oil circuit breaker inserted in each out-going circuit. High voltage lightning arresters have been omitted. The low-voltage power cables from the power station to the transformers are three-conductor lead-covered, several operating in parallel.

Twenty Years Ago

(Editor's Note.—The material in this column is taken from the Journal of Electricity, Power and Gas, predecessor of the Journal of Electricity. Twenty years ago was chosen arbitrarily because the events and personalities of that period of the electrical industry are within the memory of many of those engaged in the industry today.)

February, 1905.

The North Mountain Power Company of San Francisco has recently completed a modern 1,500-kw. hydroelectric power plant to serve Humboldt Bay and Eureka. It is a 25-cycle installation, and is therefore primarily a power rather than a lighting plant. Although there are lighting loads to carry, the frequency for such service is raised through motor-generator sets to the usual 60 cycles. The cost of raising the periodicity from 25 to 60, wherein only a small proportion of the total output goes into lighting, would clearly enough involve a less financial loss than that arising from a complete 60-cycle installation with its inherently poorer characteristics and generally inferior power service.

Each hydraulic unit, of which there are two, consists of a pair of 44-in. Pelton-type special disc wheels under one sheet steel housing. The electrical apparatus consists of two 750-kw., 500 r.p.m., 25-cycle, three-phase, Bullock generators, generating at 2,200 volts. Energy is transmitted 70 miles to a substation at Eureka at 33,000 volts. The auxiliary steam plant at Eureka consists of one horizontal, tandem compound, condensing, gridiron valve, McIntosh & Seymour engine, having a nominal capacity of 700 hp. The steam plant installation was made by Chas. C. Moore & Company, Engineers, Inc. J. C. Ralston, Spokane, is chief engineer, J. B. Rogers, San Francisco, assistant engineer in charge of construction, and H. L. Jackman, general superintendent of the company.

The San Francisco branch of the American Instute of Electrical Engineers was organized on Jan. 20, 1905, by the election of the following executive committee: George O. Squier, C. L. Cory, F. V. T. Lee, J. A. Lighthipe, A. H. Babcock.

Arrangements are being perfected for the National Electric Light Association convention at Denver and Colorado Springs during the week of June 6.

The California Gas and Electric Corporation has ordered from the Stanley Electric Manufacturing Company two mammoth frequency changing outfits of 5,000 kw. each. These outfits are for use in connection with the contract which the corporation has secured from the United Railroads of San Francisco, and will change the 60-cycle current from the Bay Counties line to 25 cycles for further distribution to the railroad company's substations.

Electric Power for Orchard Spraying

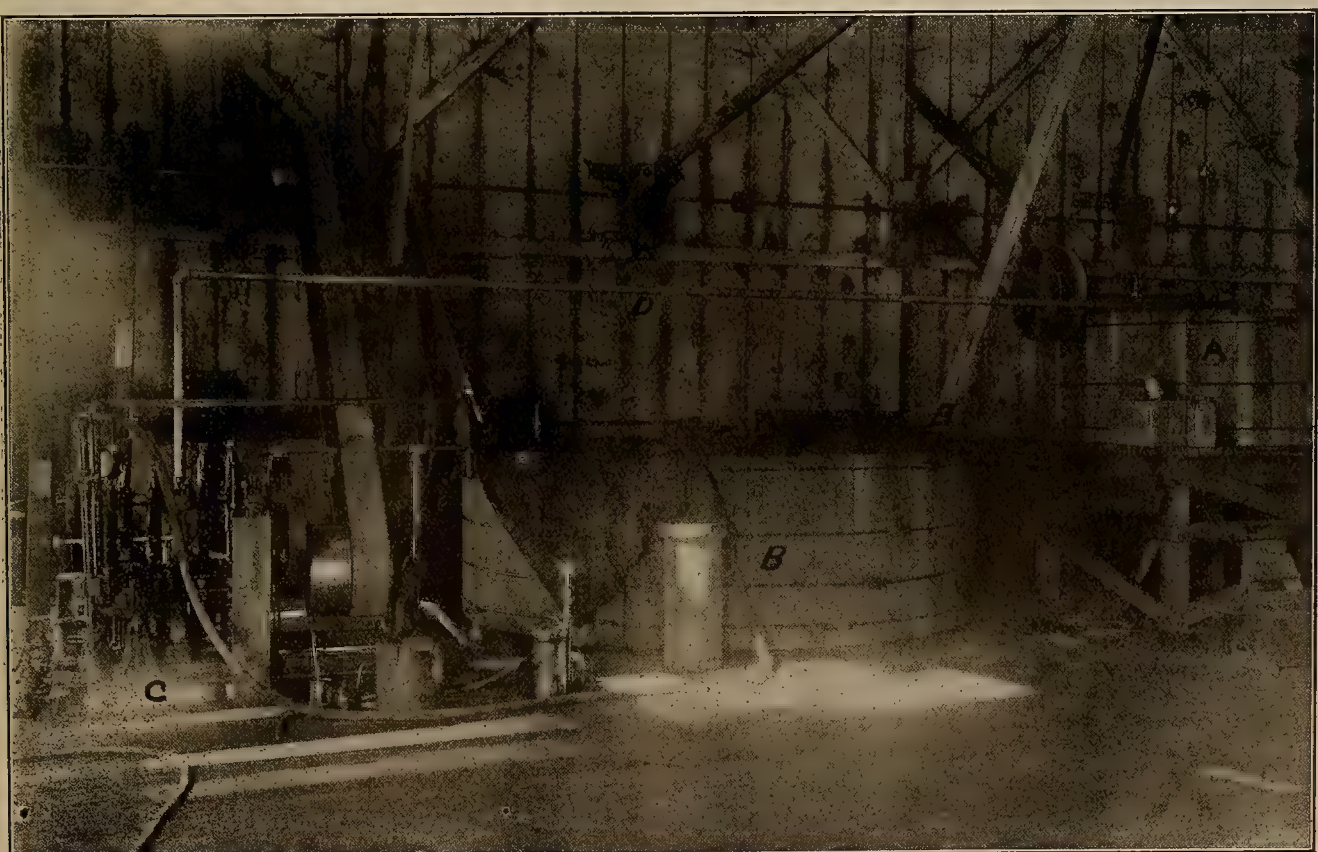
By B. D. Moses and W. P. Duruz
College of Agriculture, University of California.

WITH the development of stationary spraying plants for the orchards of California a new field of application for the electric motor is presented. It is estimated that the total power consumption required for spraying is ten million horsepower-hours, most of which is now done with gas engines. In this article the authors discuss the possibility of the adaptation of electric motors to this phase of agriculture.

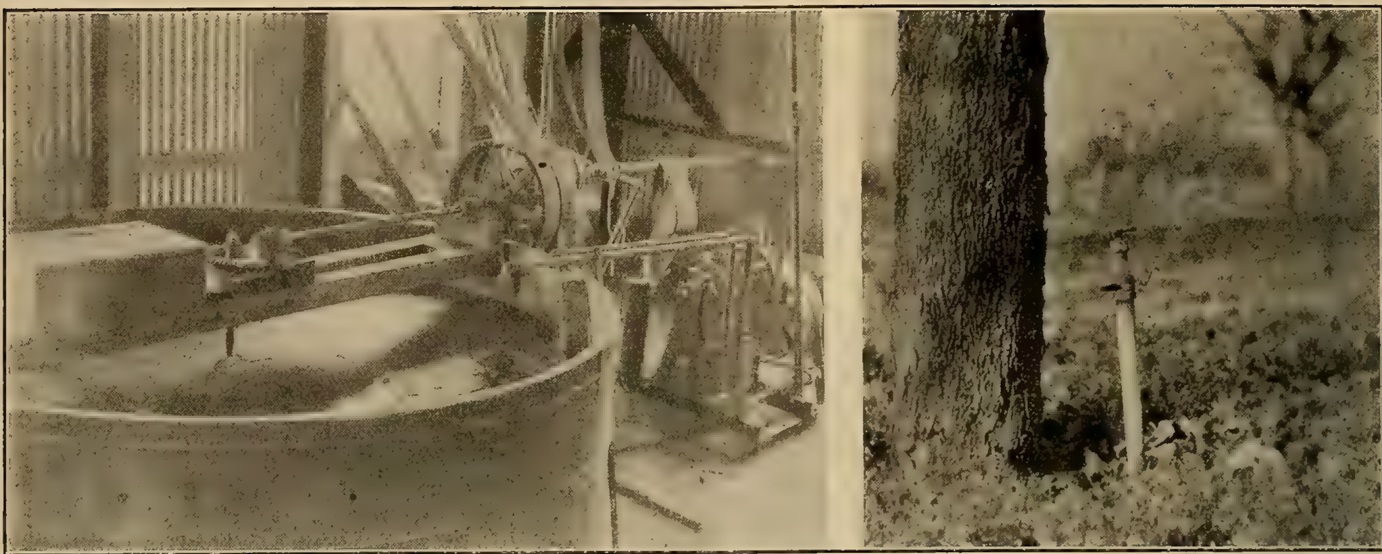
HISTORY reveals that man has been combating insects and plant diseases as far back as we have records of the cultivation of plants. Available data show that these early attempts in fighting various "plagues" (grasshoppers) and "blights" were accompanied with varied results, for in early times the control of plant enemies depended largely upon the ingenuity of the gardener or orchardist, not upon the technical knowledge he possessed. The ancients trusted in the material that had the most violent odor for results, and out of their more or less hit-or-miss practices came many experiments which through the ages have resulted in the discovery of some of the fundamentals of spraying.

The early French vineyardists were troubled with a pest which has been the source of some worry to everyone—boys—and one ingenious Frenchman resorted to the sprinkling of the vines with a mixture of copper sulphate and lime which made the fruit appear to be poisoned and frightened away the pillagers. It was noticed, however, that the vines so treated were freer from mildew than those that were not, so that this became the standard solution, known as the "Bordeaux Mixture," and it is still recognized as one of the best materials for controlling fungous diseases of plants.

Another of our present day spray mixtures was also accidentally discovered, this time through a different channel. A certain sheep man of Fresno County, California, followed the practice of dipping sheep in a solution composed of sulphur and lime to rid them of the scab. Some of this mixture was accidentally thrown on a neighboring peach tree with the result that this was the only tree that was free of San Jose scale that year. Fruit growers received



View of pumping plant, service and mixing tanks. A—Mixing tank. B—Service tank from which pump takes spray solution. C—High-pressure spray pump. D—Fresh-water pipe. (Courtesy of California State Department of Agriculture.)



A close view of the service tank with overflow pipes from the pump, and method of placing risers close to the trees to prevent damage from cultivation.

the news of the efficacy of this mixture with enthusiasm, and it became a standard spray material for combating this particular pest as well as many others.

With the development of various materials for spraying there has been a parallel improvement in the apparatus used for its application. In fact, if a spraying machine built ten years ago could be compared with today's models, the improvements would possibly be more striking than a similar comparison of automobiles. The year 1880 appears to be the dividing line between the ancient and modern methods; this year marks the discovery of the importance of lime-sulphur in controlling tree pests and diseases. The period from 1880 to 1895 was one of rapid developments. The syringe was followed by the knapsack pump, the barrel pump, the geared spray pump, and finally the gas engine or power sprayer. In about 1895 the gas engine came on the job, and since that time practically all commercial spraying has been done with specially designed pressure pumps operated by gas engines. In fact it has been said that "the gasoline power sprayer distinguishes the commercial fruit grower from the amateur." That spraying is generally recognized as a beneficial practice by fruit growers is attested by the fact that there is at least one sprayer on every fruit farm of any size in the country.

Portable gasoline power sprayer in operation. It is frequently impossible to move this heavy rig through an orchard when the ground is wet.

There are in California, according to the 1920 census, 117,670 farms. Of these some 54,000 have orchards, and data secured from the various spray manufacturers indicate that there are approximately 10,000 portable spray rigs used by the farmers in this state, requiring the equivalent of some 30,000 hp. and consuming approximately 10,000,000 horsepower hours per year.

Up to the present time practically the entire load has been carried by the gas engine. Now it seems that we are on the threshold of a new era in spraying, marked by the use of a stationary spray plant, which offers the first opportunity for the use of the electric motor.

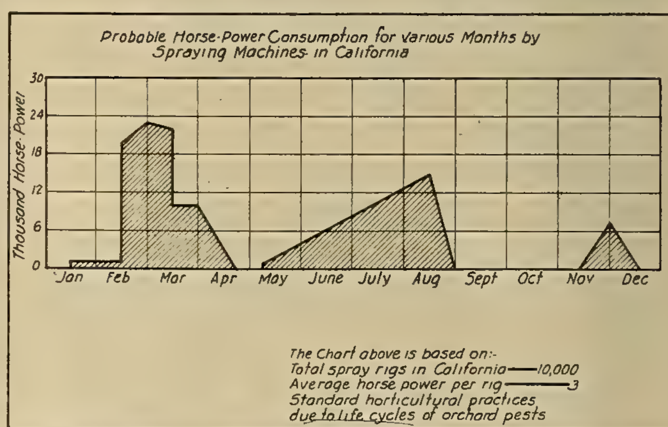


Chart showing load characteristics of portable spray rigs in California for 1924.

Pressure regulation is obtained through the bypassing of the liquid into the service tank whenever the pressure at the nozzles reaches its maximum value; this naturally takes place when the nozzles

Views showing the method of laying the pipe lines and spraying of cherry trees at a distance of half a mile from the pump. Note the high pressure attained. (Courtesy of California State Department of Agriculture.)

are closed. However, upon the opening of the valve the pressure drops and the regulator automatically closes the by-pass, permitting the pump to dis-

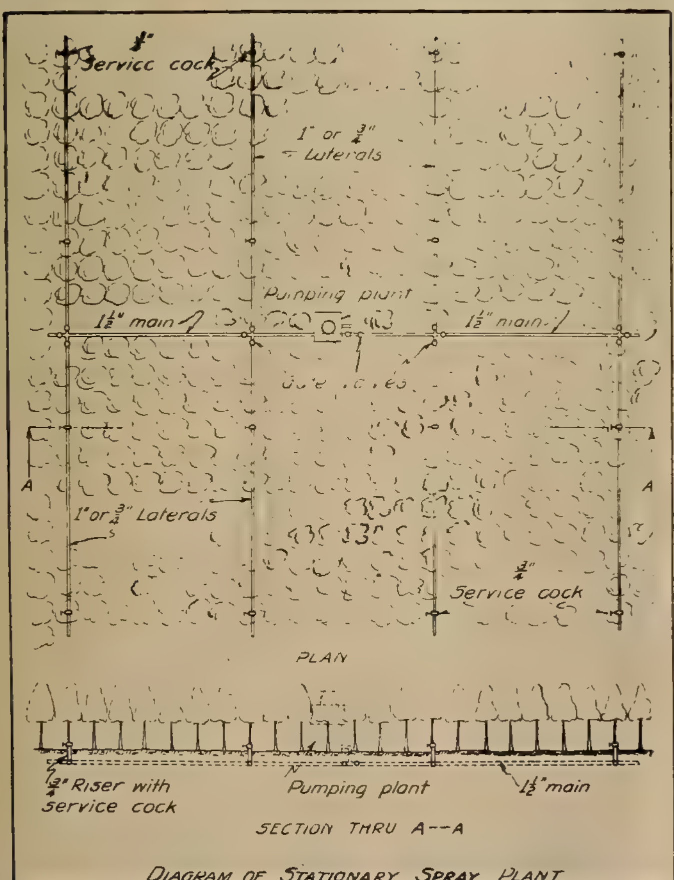


Diagram of orchard showing method of installing stationary spray plant.

charge directly into the main. It can be seen, therefore, that there will be a wide variation in load and that perfect motor control is essential.

The electric motor meets the requirements of uniform speed under varying load conditions, is compact, clean and efficient. The size of the motor will vary from 3 to 10-hp., depending upon the acreage served, and because of the short time it is used, only some thirty days per year, this same motor should be used for running other machinery on the farm in order to minimize the demand charge. For example, one grower uses his spray pump motor for sawing wood, cutting silage and filling silos, as an emergency for his irrigation pumps, and several other odd jobs.

Experts estimate that in the early spring when spraying is most essential at least 75 per cent of the spray rigs in California are in operation. This means then a possible load at this time of some $10{,}000 \times 3 \times .75$ or 22,500 hp. Spread throughout the year the consumption would total possibly 10,000,000 horsepower hours.

The accompanying chart on page 130 graphically shows load characteristics.

The Committee on Relation of Electricity to Agriculture, realizing the growing interest in stationary spray plants, has undertaken their study with W. P. Duruz of the Division of Pomology, College of Agriculture, University of California, as chairman. In a recent survey the committee has located several such plants in northern California that have been in satisfactory operation for about ten years, and at present another large pear grower near Sacramento is piping his orchard for the installation of a new plant. Many other fruit growers are seeing the advantages of stationary spray plants and are making plans ahead for their installation.

There exist many such problems in connection with agricultural production that are deserving of the joint effort of the farmer, the electrical engineer, and the Agricultural Experiment Station.

The Modern Home of the Los Angeles Gas & Electric Corporation

THE new office home of Los Angeles Gas & Electric Corporation, in which the utility recently has become settled, marks a forward step in the history of that organization and thus in the history of the community it serves. Located at 810 South Flower Street, in Los Angeles, the new office structure was opened for public service Jan. 19. It is a Class A, limit-height building, containing twelve floors besides mezzanine and basement, and is of steel-frame, fireproof construction throughout.

In considering this new structure, which houses at the present time over 700 employees of the main office departments, some interesting contrasts are provided in the earlier history of the utility. When the Los Angeles Gas Company, the original organization, was started in 1867, the total payroll consisted of five persons whose combined monthly salary was only $255. With this in mind it is not surprising that at that time office headquarters were not much of a problem. In 1869, however, office room was rented from Perry & Woodworth, and in 1885 there was sufficient growth to necessitate larger quarters at 9 Sonora Street, (now Republic Street), and later at 295 North Main Street. In 1889 the Los Angeles Lighting Company, another predecessor, was formed and quarters taken in the basement of the Burdick Building at the northeast corner of Second and Spring Streets. At the same time the appliance department was situated across the corner in the basement of the Bryson Building. The period from 1891 to 1903 saw the offices located at 457 South Broadway where the Metropolitan Building now stands.

Up to this time all the company offices had been in rented quarters, but in 1903 the building at 645 South Hill Street, which was vacated recently, was built and occupied. At that time that location was considered to be "out in the country." Today, however, the utility's new home is in the center of the business district at Eighth and Flower Streets.

The facade of the new structure, which is of the style of architecture popularly known as "early Italian," is of Indiana limestone with a base of native granite, with the exception of the two upper stories. Three arched doorways, with wrought-iron gates and screens, open into the main lobby. An impression of solidity, characterizing the purpose of the building, is given by the whole front design.

The chief direct contact with the public is by means of the spacious lobby which occupies nearly the whole of the first floor. In this room the walls are covered for two-thirds of their height with Roman travertine. Botticini and black and gold marbles are used in the counters. For floor materials several kinds of marble arranged in variegated designs are used. Directly off the lobby is a room of handsome appointments reserved exclusively for the use of patrons. Illumination is furnished through a number of chandeliers, each 8 ft. in diameter. Each chandelier is equipped with lamps having a capacity of 7,000 watts. To the south of the main lobby is the elevator lobby, walled its entire height in Utah Golden Travise marble.

The principal executive offices are on the ninth floor. Here are located the offices of the president, the vice-president and general manager, and the directors' room. Other officials are placed on those floors most convenient to those departments directly under their charge.

The twelfth floor of the building has been planned for employee welfare exclusively. A cafeteria, lounge and reading rooms, an assembly hall for meetings, dances and entertainments, and committee rooms have been fitted out for the comfort and convenience of all employees.

Many interesting features of modern construction are embodied in the utility's new home. Among these are an automatic inter-departmental telephone system, in addition to the usual telephones; a pneumatic carrier-tube system for the transmission of written matter; high speed elevators; an automatic elevator for transportation between departments; a freight elevator; an electric clock system; a refrigerating system which distributes cool, filtered water to all parts of the building; basement parking space for thirty-five automobiles; a flood-lighting system which illuminates the front of the structure with any desired combination of colors; and vacuum cleaning connections throughout.

The basement parking space has been found to be extremely convenient by those having company cars that are used in the city during the daytime. Traffic conditions are such that parking space on the streets adjacent to the building is seldom available, and were it not for the garage in the basement of the new building much time would be lost in parking automobiles, even when the driver wished to stop for only a short time. Regulations regarding the parking of cars in the basement garage have been passed with a view toward keeping space available in case of unexpected demands and for those men whose work is such that a readily accessible parking place is essential.

After the Los Angeles Gas & Electric Corporation had moved into its new building, an advertising campaign, planned to acquaint the public with the fact that the company was occupying new quarters, was launched in the Los Angeles papers. Advertisements showing the architect's drawing of the building were used in the various special Christmas and New Year editions of the newspapers to invite the attention of the public to the new home of the utility serving the southern California city.

THE new home of the Los Angeles Gas & Electric Corporation was designed to present an appearance of great stability. The exterior of the building, (1) adds considerably to the character of the office buildings in Los Angeles. The lobby of the building, (2) which is especially well arranged, was laid out to serve customers easily and efficiently. The office of the president of the company (3) is situated on the ninth floor.

CENTRAL STATION CONSTRUCTION OPERATION AND MAINTENANCE

Industrial Site Effects Concentration of Supplies

San Joaquin Light & Power Corporation Operates Efficient Supplies—Handling System at New Location

By D. P. MASON, Manager Supplies Division,
San Joaquin Light & Power Corporation, Fresno, Calif.

Concentration of all supplies and material has been effected through the operation of the new industrial yards of the San Joaquin Light & Power Corporation at Fresno, Calif. These yards consist of more than fifteen acres of land upon which are situated two fireproof reinforced-concrete warehouse buildings, a pole-treating plant, a crossarm mill, pole storage yards, a pipe storage yard for the water company division, and storage space for miscellaneous construction equipment. One of the warehouses is used for transformer storage, testing and handling while the other serves as a general supply warehouse. The industrial site is located just east of the city limits of Fresno along the Sanger branch of the Southern Pacific railroad at Orange Avenue, and is adjacent to the California Avenue substation.

The transformer warehouse is 400 ft. long, 42 ft. wide and 37 ft. high to the top of the fire wall. Construction is entirely of reinforced concrete with the exception of the roof trusses, purlins and crane girders which are steel. The floor is laid over an earth fill which brings the level up 4 ft. above grade to standard freight platform height. This reduces the handling charges on incoming and outgoing materials. Five inches of concrete laid on the earth fill and reinforced with ⅜-in. square deformed bars provides a floor capable of carrying the heavy loads that may be imposed upon it by heavy transformers and the stacking of small transformers.

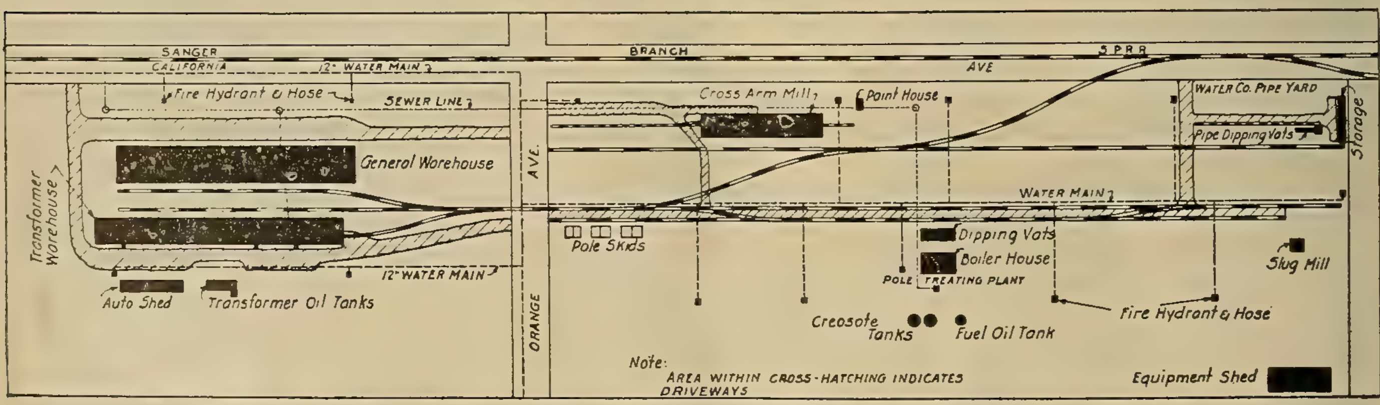
In order to hold the crane span down to economical limits the building width was selected to fit the crane rather than vice versa. Slightly over 18-ft. clearance between the floor and the crane hook provides what was determined to be an economical height to which to stack transformer crates. With this in mind and knowing the space necessary for transformer storage purposes alone as well as the space required for testing and repair facilities, it was determined that a building 400 ft. long would be necessary to fulfill the requirements adequately.

Station transformers requiring additional head room for handling are provided for at the east end of the building where the floor is constructed at grade. A spur track extending into the building at this end facilitates the unloading and handling of heavy equipment. A large pit is constructed below grade in this section of the warehouse in order that station transformers may be lowered into it to obtain sufficient clearance for pulling the windings for inspection and repair.

A three-motored traveling crane of 10-ton capacity and operated entirely from the floor serves the entire length of the transformer warehouse. The capacity of the crane is sufficient for the largest transformers that are handled at this place. Control by hand line from the floor makes it possible for one man to do the work that would require two or three with a cage-controlled crane. Moreover, the safety factor is improved, for the operator knows exactly what he wants done and does not have to depend upon signals which are easily misunderstood.

The provision made for expansion and contraction is a feature in the construction of the building that is of interest.

Looking west across Orange Avenue from the entrance to the pole yard. The transformer warehouse appears at the left and the general supply warehouse to the right.



Plot plan showing the general layout of the industrial yards of the San Joaquin Light & Power Corporation at Fresno, Calif. The developed site comprises some 15¼ acres.

Owing to the wide range between summer and winter temperatures in this location, an expansion of as much as 4 in. must be provided for. Otherwise the recurring stresses would wreck the building in the course of a few seasons.

Transformers and induction regulators and test tables are arranged along the wall while the high tension leads are carried overhead on swinging brackets which make it possible to reach all portions of the test floor.

floor and lower truss chord provides economical storage space.

Architecturally the building is similar to the transformer building, with the exception of the full length platform on each side. Windows are also arranged to provide at once ample light and maximum storage space, high sidewall windows and a monitor skylight of Truscon steel sash having been adopted. These sidewall windows are glazed with 21-oz. clear glass and operated for purposes of ventilation by means of torsion-type mechanisms and hand-wheels located at a convenient height from the floor. A floor 4 ft. above grade, and expansion joints in the walls the same as in the transformer building, are also provided. The 40-ft. open platform at the west end of the building is complete as to foundation and arranged to receive the walls and columns of a future addition when it is needed.

The general supply warehouse is fitted out not only for general storage purposes, but also houses the salvage department and the printing department. Steel shelving and bins are provided throughout and are found to afford a maximum of storage space and to give a neat appearance. A motor-operated stacker effects economical use of floor space and is more adaptable to this general usage than a crane. The machine is capable of lifting a ton.

Suitable office and lavatory arrangements are provided in both buildings. Each warehouse is served by a standard-gage spur track running the full length of the building, making possible the handling of several cars at each warehouse at the same time without interference.

Facilities for storing about 25,000 poles are provided at the company's pole yard located just east of the ware-

The old transformer storage space at the old pole yard.

Two expansion joints divide the building into three separate units, thus localizing and reducing the motion to be cared for at any one place. The expansion joint is constructed at a column and is such that the wall may slide in a slot provided in the column. The end of the wall and the slot are metal-clad to prevent spalling of the concrete as movement takes place.

Storage tanks providing a capacity of 12,500 gal. for new transformer oil, 5,000 gal. for filtered transformer oil, 5,000 gal. for unfiltered transformer oil, 5,000 gal. for new switch oil, and 2,500 gal. for unfiltered switch oil are mounted on reinforced concrete saddles about 40 ft. from the south wall of the building. Sumps in each tank facilitate the removal of any water that might collect.

A complete system of piping, two rotary pumps and a filter press make possible full and flexible control and use of the oil. Each grade may be handled independently of the others by proper manipulation of the valves. All valves and the oil-handling machinery are located in the central section of the transformer warehouse. Gages indicating the level of oil in the various tanks and the sections of tanks where the tanks are partitioned, are arranged on the wall inside of the warehouse and adjacent to the handling equipment. To facilitate quick control of oil flow and to aid the operator in correct valving, a large multi-colored chart of the system is also mounted on the wall near the equipment. Valve numbers on the chart correspond to the numbers on the valves themselves. A pipe line extends to the railroad siding for unloading cars.

Transformer-testing equipment is set up opposite the oil-handling apparatus. Complete over-all tests are readily handled with this test apparatus.

Adjacent to the transformer warehouse is the general supply warehouse. Dimensions of this building are somewhat different from those of the transformer warehouse because of the different class of service for which it was designed. The building is 60 ft. wide,

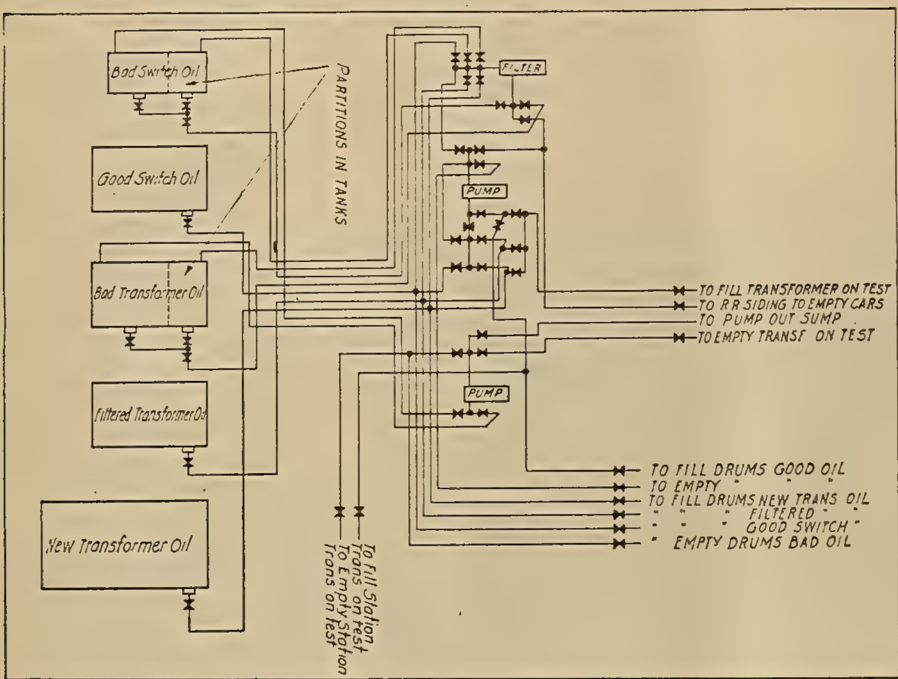
Showing the two locomotive cranes, both of which in this case happen to be operating on the south-track. Part of treating-plant superstructure is seen in background between the two cranes.

380 ft. long, 30 ft. high to the top of the fire wall and has a 40-ft. open platform at the west end. A covered loading platform 6 ft. wide runs the full length of the building on each side. Fourteen feet clear headroom between

house yards across Orange Avenue. The two are connected by a standard-gage spur track and two driveways. Three standard-gage tracks extending the full 1,300-ft. length of the pole yard afford ready transportation access to all parts

of the yard. Two of these tracks are laid one on each side of a main central driveway and far enough apart that the two 10-ton stiff-legged steam-operated locomotive cranes can operate at the same time without interference crew, which can in this way help itself to what it needs with no delay.

Crossarms are manufactured at a mill installed for the purpose near the northwest corner of the yard where it is handy to the driveway which serves



Schematic diagram of piping system used for handling transformers and switch oil. Provisions are such that new oil, bad oil, and filtered oil are each handled entirely separately to avoid adulteration. In filtering bad oil a portion is isolated in the partitioned tanks and circulated through the filter until it is of a quality sufficiently high to permit its being either pumped into storage or into use as the case may be.

and also permit trucks to run the full length of the central driveway without interfering with either crane. Curves and switch frogs used in all spur tracks permit the operation of a road engine over all parts of the tracks. However, most of the car-shunting is done by the steam cranes. Low yard-type switch stands are installed throughout the yards to prevent their being struck when handling poles. In the yards there is a total trackage of 6,650 ft. 375 ft. of which the San Joaquin Light & Power Corporation built. The Southern Pacific railroad laid the remaining 6,250 ft. under contract.

Modern methods and equipment are incorporated in the new pole-treating plant, which is an important unit of the industrial site. Located in the center of the yard, the plant is so arranged that the treating tanks are served equally well by either crane on either of the central tracks or may be served by both at once. The plant has capacity for treating two carloads of poles per day. Methods of treatment are the same as those adopted by other modern plants for the butt-treatment of poles with an approved grade of creosote.

Skids are installed along the driveway near the entrance to the pole yard, and on these skids there is kept a stock of treated 35- and 40-ft. poles. These lengths are those most frequently called for. The beds of the skids are constructed at such height that it is possible to roll poles from the skids to the waiting trucks, thus making unnecessary the use of the crane for routine loading of poles. This feature saves not only the time of the crane and its operator but also the time of the line the skids and conveniently situated with regard to the other facilities of the yard. The mill is housed under a building 40 ft. by 200 ft., of wooden construction, open sides and corrugated iron roof. One end of this building is utilized to store part of the lumber used for crossarms, and the other end houses two cross-cut saws and a boring mill. The boring mill is a gang-operated set of bits so arranged that all of the holes needed in an arm may be drilled at one time and with one operation. A roll conveyor and a 36-in. gage industrial railroad serve the mill and lumber storage yard to better advantage than the continuous conveyor originally planned, because the intermittent operation needed in conveyor connection between mill and yard would not warrant the first cost and upkeep of a continuous conveyor.

Pipe handling and storage facilities are provided at the northeastern corner of the pole yard. A dipping vat 23 ft. long for treating the pipe and a 36-in. gage industrial railroad for distributing to storage piles after treatment are the main features of this division.

Miscellaneous bulky equipment such as cement mixers, trucks, and tractors, are stored under a 200-ft. open shed located where it does not interfere with pole storage.

Bituminous macadam paving to the extent of 80,000 sq. ft. is laid in the yards and designed to give access to every part of the yard and to every building and at the same time to occupy the least possible space. The central driveway in the pole yard is laid between the two tracks, which are necessary for the operation of the two cranes, and thus utilize space that would otherwise be useless. Construction of these roadways was handled by the corporation. However, due to not having adequate road-building facilities, there was no saving effected through this effort, and the results were not entirely satisfactory.

Fire protection has been given prominence in the design and layout of the pole yard. Ten hydrants are located at convenient intervals throughout the yard. Each hydrant is fed by a 6-in. lateral from a 12-in. main, which is laid down the central driveway. These laterals are all less than 170 ft. long. Each hydrant is covered by a small wooden house 4 ft. by 4 ft. in size. One hundred and fifty feet of hose is stored on a shelf in each one of these houses and is hooked up to the hydrant ready for use without a moment's delay. The arrangement is such that even the most remote parts of the pole-storage space may be reached by at least two lines of hose without any delay and with equipment just as it is. Three lines can be brought into play at most points.

Two Foamite chemical engines are kept at the boiler house in the center of the yard for use in quenching oil or creosote fires. Hand extinguishers distributed throughout all of the buildings

Fire protection becomes an item of extreme importance where 25,000 poles are kept in stock. Especially is this true when most of them are creosote-treated. Two streams are shown in action above, and there are eight more available. This is a top view of the treating-plant structure.

on the site serve as auxiliary equipment. A Foamite engine kept in the transformer warehouse near the oil-handling equipment reduces the fire hazard incident to the storage and handling of transil oil. Four hydrants are located where they would be most effective for the warehouse premises. All fire lines are supplied directly from the mains of the Fresno City Water Corporation.

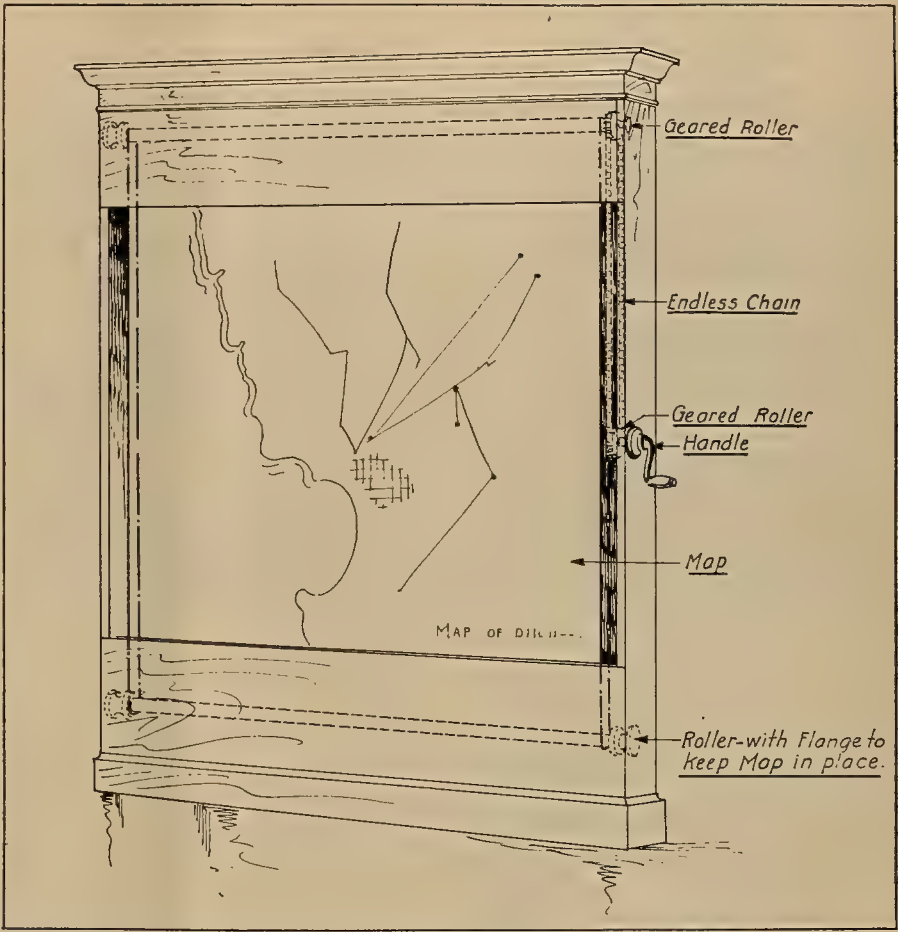
Considerable study was given to the general arrangement of the driveways, trackage and buildings with a view to providing the most convenient transpor-

Motor-operated portable stacker used in the general supply warehouse. Service outlets are located throughout the building at convenient locations. This, together with the flexible cable carried on the machine, makes possible the operation of the stacker in any part of the building. The machine has a lifting capacity of 2,000 lb. and is more convenient and economical for this general service than a crane.

tation and at the same time cut up the grounds as little as possible. Plants and equipment of other companies up and down the Coast were studied, and the best features of each used where adaptable to the needs of this company. The layout adopted permits access to every part of the yards by road and by rail in an efficient manner.

Trucks coming in for line material drive to the general warehouse, entering at the northern gate on Orange Avenue. After loading what is needed from there, they proceed to the transformer warehouse where transformers are secured, if necessary, and from there out the southern gate on Orange Avenue and directly across the street into the pole yard. The pole skids are located just inside of the gate at this point, and after picking up the required poles the truck is piloted out past the crossarm mill where the final bit of material is loaded. Leaving the mill, the truck is already headed for the northern gate leading from the pole yard into Orange Avenue. This continuous-circuit effect in loading line trucks saves time and effort and avoids all back-tracking.

The industrial yards have been in operation for about a year, and the supplies division has not had one complaint from construction or operating crews regarding service conditions. Further, the assembling of all materials at one location has made possible a material reduction in the cost of handling and distributing supplies. During 1924 about $1,650,000 worth of material was handled through the yards. Poles to the value of $250,000 were issued during the year. Transformers, wire, and general construction supplies made up the balance of the above figure.



Schematic diagram of the roller system used in the system map cabinet described in the accompanying article.

Continuous Roller Map Mounting Handy for Substation

A handy means of mounting a map of the system of the Great Western Power Company is in use at the Brighton substation of that company. In this case the several map sections necessary to cover all of the major portion of the company's transmission have been mounted upon a strip of heavy cloth and properly matched up to form a continuous map. This strip is endless and runs on two rollers mounted in a cabinet as shown in the accompanying illustrations. The operating mechanism consists merely of a small sprocket wheel attached to one end of the upper roller and a similar sprocket mounted lower down on the side of the cabinet where it is within convenient reach of the operator. A small chain connects the two sprockets.

The cabinet is about seven feet high and six feet wide, and provides an inexpensive and handy medium of support for transmission maps. Any desired portion of the map may be rolled into view with but a moment's effort. Due to the continuous cloth mounting, it is not necessary to roll the map in any one particular direction.

Roller-map cabinet devised to accommodate the system map for the convenience of the operators at the Brighton substation of the Great Western Power Company.

IDEAS FOR THE CONTRACTOR

Wiring Residences for Electric Service

By G. Walter Spencer

Proprietor, Spencer Electric Company, Oakland, Calif.

The 1924 building program of the United States is estimated at about six billion dollars. Of this estimate—

4.1 per cent is for public buildings
6.7 per cent is for churches
7.6 per cent is for hospitals
10.2 per cent is for offices
12.7 per cent is for industrial plants
19.7 per cent is for schools
38.9 per cent or approximately $2,332,000,000 is for residences

Recently an effort has been made by the electrical industry to have the wiring of residences total 3 per cent of the total cost of the building. Assuming, for the sake of argument, that this 3 per cent figure has not yet been reached but that a 2 per cent figure might be taken as a fair average, this building program of $6,000,000,000 should show a total wiring expenditure of $46,640,000. It seems fair to use this 2 per cent figure on account of the fact that the ratio of wiring expense to total building costs has been constantly increasing due to the fact that better wiring jobs have been done and that residences have been more completely wired for electric service. For example, a residence wiring job in a modest house that four years ago at the highest wiring prices would have cost about $75, today is bringing more than $75 due to additional brackets, outlets, convenience outlets, wiring for electric ranges, electric heaters, etc. It should be borne in mind that this is true despite the price reductions in the cost of materials that have taken place within that period. The value to the consumer, that is to say, to the owner or tenant of the premises, of adequate facilities for complete electrification of the home has been proved so often that the electrical contractor who makes a specialty of taking jobs purely on a low price basis is no longer in favor. At too great a cost, the home owner has learned that cheapness seldom brings satisfaction. The cost of this lesson has been borne, too, by the contractor-dealers, who have learned, greatly to their sorrow, that low price wiring jobs not only did not show them a profit on the work they had so taken but that these jobs kept the contractor-dealer from making the legitimate profit to which he was entitled on an adequate installation. This type of contractor-dealer has, too, fallen into disrepute in trade circles, has generally fallen behind in the payment of his bills, and has altogether become an undesirable member of the electrical fraternity. He has also lost caste in the eyes of the home owner and has generally gained a reputation of being an undesirbale person with whom to do business.

In striking contrast with this type of contractor-dealer is the man who has studied his business, has given heed to the growing demand for electrical service in the home, who has kept pace with that demand and instead of trying to cheapen each job, has, instead, tried to sell the home owner the most completely electrified home possible, knowing that, while to do this would undoubtedly result in a much higher bid than that of some cheap competitor, the ultimate satisfaction to the owner of the property would be sufficiently great to justify any effort the contractor might put forth toward raising the standard of installation. The really alert contractor-dealer has not alone been satisfied with maintaining code standard of installation such as exclusively conduit wiring, enclosed entrance switches, etc., but he has gone further and has induced the home owner to install lighting and convenience outlets in places where they were not originally specified. He has done this in order that the owner might have the

ESTIMATE

Date ______ 192__

Spencer Electric Company
"Efficient Electrical Service"
320 12th STREET, OAKLAND

Oakland 492 Oakland 3233

M ______ Address ______

For the sum of ______ dollars we will install electrical wiring as listed below, in building located ______

Owner ______ Address ______

Terms are three-fourths payment due on completion of roughing-in and balance 10 days after job is completed. Payments for all extra labor and material shall be made at the time such extra labor and material are furnished. This estimate is governed by the terms and conditions herein contained and printed on the back hereof.

______ Spencer Electric Co.

Accepted ______ 192__ By ______

	Ceiling Outlets	Bracket Outlets	S. P. Switches	3-Way Switches	Con'ce. Outlets	Push Buttons	Special Outlets	Heaters					
Front Porch													
Reception Hall													
Living Room													
Dining Room													
Kitchen													
Breakfast Room													
Service Porch													
Pass Hall													
Bath No. 1													
Bed Room No. 1													
Closet													
Bed Room No. 2													
Closet													
Upper Hall													
Bed Room No. 3													
Bed Room No. 4													
Bath No. 2													
Sleeping Porch													
Basement													
Rear Porch													
Garages													
Total Outl's													

Good home lighting is the essential part of living

Electric Lighting Fixtures

We will gladly help you plan and offer our expert services.

Front side of estimate sheet used by Spencer Electric Company, Oakland, Calif. Note that detailed specifications of all outlets for each room are clearly shown and that the total is also given as a check.

All work to be done in a good and workmanlike manner, and in accordance with the ordinances, if any there be, of the city in which it is to be performed, and with the laws of the State of California, and when not covered by such ordinances and laws, the rules of the National Board of Fire Underwriters shall apply.

Should there arise any condition to necessarily hinder carrying on the work as specified and ordered, and over which the Spencer Electric Company has no control, the Spencer Electric Company is at once entitled to and must be paid on demand an amount not less than eighty (80%) per cent of the estimated cost of work that has been performed and material furnished, and that the balance of the estimated cost of work performed and material furnished must be paid within sixty (60) days from date of notice by the Spencer Electric Company of their inability to further proceed with the work.

In the event of the failure to pay any installment or installments on the contract price herein provided for, when due, then the Spencer Electric Company at their option, which option shall continue during all the time of such default, may remove from the premises any materials or fixtures that shall or may have been installed therein by them or delivered by them to the premises, and may apply the value of such materials or fixtures so removed on account of any indebtedness due them on the contract. The option herein provided for shall be in addition to any and all other remedies the Spencer Electric Company may have to enforce their contract, either in law or equity.

The Spencer Electric Company is not familiar with the condition of the legal title to the property covered by this agreement, and if at the time of the execution of this agreement or at any time prior to the actual commencement of work by the Spencer Electric Company under this contract it should appear that there is a trust deed, mortgage or judgment lien upon said property, or said property is subject to a first mortgage or first deed of trust, then and in that event the Spencer Electric Company may, at their option, refuse to further proceed with the work, and the Spencer Electric Company shall in no way be liable for any damages whatsoever by reason of such refusal In the event the Spencer Electric Company shall abandon the work for either of the reasons above stated, or in the event of loss by fire, the price mentioned herein for the completed work shall be disregarded and payment in full for all work done to that time shall be immediately due and payable, the value of such uncompleted work to be determined on the basis of the cost of labor and material as specified in Pacific Coast Electrical Data and Sales Book.

If suit be commenced or other legal proceedings be taken to enforce the payment of any amount due under this contract, a sum equal to twenty-five (25%) per cent of the amount of this contract shall be added to such amount for attorney's fees.

Payment for roughing-in work or allowing later work to proceed shall constitute an acceptance of the roughing-in work as satisfactory and no claim shall be made against the Spencer Electric Company for damages or errors after the work has been passed by the City Inspector "Roughing-in" work includes only work necessary to pass "roughing-in" inspection under the ordinance, laws or rules governing the work. The Spencer Electric Company shall not be responsible for damage to fixtures after they are installed. The Spencer Electric Company shall not be held liable for any loss, damage or delays occasioned by fires, strikes or other causes beyond their control.

Any change in the location of an outlet from that shown on plans, or as originally agreed upon, shall constitute an extra outlet, payment for which shall be made as specified in Pacific Coast Electrical Data and Sales Book.

All appliances, equipment, fixtures, switches, and other material or property of any kind or character whatsoever, which may be removed from the structure upon which they have been placed by the Spencer Electric Company under this agreement, without the destruction of any wall, floor or foundation, shall not be considered as affixed to the said premises, and shall remain the property of the Spencer Electric Company until full payment for same shall have been made All payments made under this agreement shall be applied first to the payment for labor, and secondly to the payment for material affixed to said premises, and the remainder to the payment for fixtures, appliances, equipment, switches, and other property furnished or owned by the Spencer Electric Company

Reverse side of form used by Spencer Electric Company, Oakland, Calif.

most truly convenient use of electricity at any spot in the home where electrical application might be desired. He has also made provision for the future use of additional electrical equipment. For example, in those cases where the owner of the property was not yet ready to use electricity for cooking or heating, the conscientious contractor-dealer has induced the owner at least to put in conduits to the various rooms at the time of construction so that in the future when it might be desired to apply electricity on a larger scale to the domestic life of the occupants, the expense of installation would be very materially lessened.

A contractor-dealer who is really interested in putting the best possible job in a residence will, instead of taking the meager plans and specifications usually furnished, get in touch with the owner of the property and go over the plans room by room explaining in detail just where outlets, floor plugs, switches, bells and other calls and all electrical features should be located. He will also explain the purpose of each of these various devices in order that the property owner may make an intelligent decision. Owing to the fact that architects are generally not fully informed as to the proper application of electricity in the home, it is almost always possible to put in one or more extra outlets in the laundry, kitchen, dining room, living room and so on. These additional outlets should be carefully plotted out on the plans and the reason for recommending them should be carefully explained.

Not the least important part of a contractor-dealer's work is to have an adequate and complete estimate sheet. This is necessary in order that nothing be left off and also that no necessary computations be omitted in figuring the cost and selling price of the job. For a contractor's own protection he should use a contract bid form of estimate. This form is in effect a lease-contract and contains very clearly established terms of payment as well as a complete outline of the material and labor to be furnished, together with the net selling price of the job. The contract bid form is signed by the contractor and is also signed by the one accepting the bid, and provision is made in the terms of the contract for the protection of the contractor as to appliances, equipment and other material which may be removed, if necessary, without destruction of the wall, floor or foundation. This is an extremely important provision of the contract and constitutes a big item of protection on those jobs which become financially involved. I have in mind the case of a contractor-dealer who had over $900 worth of equipment on a job when the general contractor got into financial trouble. The net result was that at the bankrupt sale, which was held some time later, it was necessary for the electrical contractor to appear and buy back his own material at a cost of approximately $200. It hardly seems necessary to enumerate the various expenses which he had to absorb on this job such as overhead, interest, labor, lack of profit and so on, all of which would have been eliminated had the job been done under a contract bid. Figures 1 and 2 show the form used by the Spencer Electric Company in rendering estimates. This form has been found very satisfactory in practice over a period of several years.

Many Electric Apartment Houses in Sacramento, Calif.

Electrical contractor-dealers have a splendid opportunity for increasing the volume and improving the character of their work by selling the idea of complete apartment house electrification. There are now so many all-electric apartment houses that owners and builders are generally found to be in a very receptive mood. The return to the contractor justifies the effort expended and a satisfactorily equipped electrical apartment house paves the way for future wiring business of similar nature.

Some of the apartment houses of Sacramento, Calif., that have recently been fully electrified. Wiring for electric ranges, water heaters and air heaters has been installed.

That apartment house owners of Sacramento, Calif., realize the value of electrical equipment is well proved by the accompanying pictures of electrical apartments in that city. The Florence Delahunty apartments, at Forty-second and J Streets, contain four 4-room and four 5-room apartments. These are completely electrical, each being equipped with a Hotpoint-Hughes Super-Automatic electric range, three 3½-kw. Wesix flush type electric air heaters and one 2½-kw. Wesix portable air heater. A 7½-kw. Wesix water heater connected with a 200-gallon storage tank provides a central water heating plant for all of the apartments.

The Edith Grove apartments at 1617 I Street contain twelve 2- and 3-room apartments. Each is provided with a Standard electric range, and each room is equipped with a 1,000-w. convenience outlet for portable air heaters.

The Lauppe apartments at 1321 K Street were recently completed. They are located in the rear of the store and apartment building erected by Frank Lauppe several years ago. There are twenty-two 2-room apartments, and each is equipped with a Standard electric range.

Denver Contractors Issued Licenses.—Contractors' licenses have been issued in Denver recently to W. H. Fick, operating as the Castle Electric Company, and to C. W. Macy, 1462 South York Street. Walter Coburn, who has been operating a contracting business from his own home for several years, will shortly open a retail store at 50 Broadway.

Advantages of Membership in the California Electragists

By Walter F. Price,
Executive Secretary, California Electragists.

It is repeatedly asked by electrical contractors and dealers, "What can I get out of membership in the California Electragists, and what are the benefits that I am not already receiving?" A trade association is based on this fundamental principle: No one man in business can accomplish as much alone as a group of men in the same business can accomplish through united effort. It is rapidly becoming recognized among business men that unless a man is affiliated with his trade associations in a substantial way there must be something wrong with his business policies, he is an obstructionist in his line, or he is considered too unreliable by his competitors to be accepted as a member of the association. There is also the type who is always looking for a "free ride," continually expecting to cash in on the other fellow's development efforts. No man in business can afford to be avoided by his community for lack of membership in his trade associations. "Every man owes some of his time to the upbuilding of the profession to which he belongs."

The Association of Electragists, International, is organized for the protection and upbuilding of the contractor-dealer branch of the electrical industry. A member may expect out of the association proportionately what he puts in. A hasty glance over the list of active association members will soon convince that they are the most successful contractors and dealers in the business. Membership in the California Electragists, which is affiliated with the international association, includes membership in the Association of Electragists without further cost and with it all of the rights and privileges to the use of the registered trademark, "Electragist," which is rapidly becoming a national emblem of responsibility for the contractor and dealer, technical data, cost records and business helps prepared by experts for members of the association.

The word "Electragist" was designed

for the Association of Electragists, International, from the Greek words meaning "He who leads electrically," and is defined as "an active leader in the business of high-grade electrical contracting and retailing, who is a member of the Association of Electragists, International." This trademark is zealously protected by the association for the benefit of its members. In districts where it has been in use the public seeks an Electragist because of his responsibility as an active leader in the community and his reputation for dependable service.

It is only through the state and national association that things can be accomplished in a big way, such as dealings with other branches of the industry and representation on the committee that drafts the National Electrical Code. Without such an organization to take up recommendations on code matters, the electrical contractors would be helpless and would have to content themselves with just what is handed to them in the Code. The so-called 15-ampere unlimited branch circuit in the 1923 Code is a good example of what they have to accept against their wishes. An active Code Committee, under the chairmanship of A. Penn Denton of Kansas City, is now at work on Code matters, and with representation on the executive committee of the Association of Electragists and the local code committee Electragists have a voice in the matter and look forward to further benefits.

The jobbers are well organized, the manufacturers, and the power companies. Why then should the contractor-dealer be the weak link in the business and continue to take dictation from the rest of the industry? "In unity there is strength."

English Contractors' Association Protects Its Membership

Electrical contractors' trade associations are growing in number and strength in nearly every section where the contracting business exists. There are numerous strong contracting organizations in the United States, and England now has an organization of this nature. The conditions for admission to this organization, the National Register of Electrical Installation Contractors, are considerably more rigid than is common in this country. The following, taken from a letter from the secretary of the National Register of Installation Contractors indicates most clearly that membership in this organization is not a thing easily obtained. A contractor must measure up to a very clearly defined standard before he can gain admittance to the ranks of the association.

"Briefly, this Association has been formed for the purpose of supporting bona fide installation contractors and the suppression of the bogus ones, and we have a certain standard of qualification which every applicant for registration must possess. These applications are thoroughly sifted both by the Executive in this office, and a Local Advisory Committee composed of a representative of the Supply Industry, the Institution of Electrical Engineers, and of the Electrical Contractors' Association respectively, functioning in the District from which the application is made. If the report of this Local Advisory Committee is satisfactory, the application is again considered by a Scrutinising Committee in this office, who, if satisfied, recommend the application to the Executive for acceptance, and acceptance generally follows. If the Local Advisory Committee do not recommend the application, they are requested to state fully why, and this report comes before the Scrutinising Committee who being satisfied put in a recommendation to the Executive that it should not be accepted, and it generally follows that this happens, but the point that I am making here, is, that every effort is made by the Executive to protect a legitimate contractor, and that three sets of officials have to be satisfied one way or another as to whether the applicant shall be, or shall not be accepted."

Motor Company Aids Improvement In Wiring Conditions

Electrical contractors are striving through their associations and individually to improve general trade conditions. As a contribution to this movement the Pacific Electric Motor Company, Oakland, Calif., has recently issued a four-page circular for distribution to builders, home owners, industrials and others who may require electric wiring service. The first and second pages of this circular are reprints from the recently enacted provisions of the Oakland electrical ordinances, which became effective on Jan. 1, 1925. The other two pages contain comments stressing the need for employing qualified firms for electric work and the necessity for complying with the ordinance together with this statement, "Published by the Pacific Electric Motor Company as a contribution to the movement for better electrical work."

Post Office Department Rules on Apartment Letter Boxes

It has for some time been customary, at least in the West, for the electrical contractor to install the door call or door telephone and mail box system. The increase in the number of apartment houses has resulted in an increased number of manufacturers of apartment house letter boxes, and there have been produced many widely varying types and styles. Some of these types have been well adapted to the purpose of the Post Office Department, while others have occasioned the carriers considerable delay and inconvenience.

This latter fact, together with the fact that receptacles provided for the receipt and delivery of mail and the mail deposited therein have the protection of the law against injury, destruction and theft, caused the Post Office Department to issue uniform regulations for the installation of apartment house letter boxes. These regulations, of course, are effective where apartment house or hotel management has not arranged that mail be delivered at the office or desk for distribution by its employees, and the regulations apply to apartment houses, family hotels and flats containing three or more apartments. In order No. 9596 from the office of the Postmaster General, it is decreed that such mail receptacles shall be arranged in groups of such number as may be practicable, each group to be equipped with a master door, on the opening of which the entire group of receptacles is accessible for the deposit of mail by the carrier. The master door shall be secured by a lock furnished by the Post Office Department for use as long as mail is delivered by letter carrier and the key of the lock shall be in the

(This sheet is an exact reprint of the first leaf of the Rules Governing Electrical Construction in Oakland, which has just been issued by the Electrical Department.)

SPECIAL NOTICE TO THE PUBLIC.

It should be clearly understood that these rules and regulations do not constitute complete specifications for electrical work or installations. They simply prescribe and establish a reasonable minimum standard of safety. Inspections are made only for the purpose and to the extent of determining that the minimum requirements have been met. Specifications for electrical installations are not complete when they simply require compliance with municipal or other regulations without specifying further details.

The suitability, operating efficiency, convenience, finish, appearance, and value of an electrical installation may be varied or affected in many respects without departure from any prescribed regulation.

Numerous details which may so affect the design or quality of an installation cannot properly be included in the requirements of any safety regulations. All of the methods, materials, devices, etc., which are approved for a given purpose are not of equal merit or value. Approval simply means that they meet the prescribed minimum standards.

Hence, in a case where there are no detailed electrical plans or specifications upon which all bids are based alike, and two or more proposals are submitted, the mere fact that the work covered by either or all of the proposals will comply with the regulations and pass inspection gives no assurance that the proposed installations are of equivalent value or that they will afford an equal degree of satisfaction to the owner or user.

To be sure of obtaining an installation that will fully meet his individual needs and requirements, the owner should have the work planned and have it installed by trustworthy and responsible parties who are properly qualified to handle the particular work which they undertake. A certificate of inspection should invariably be required upon completion of the work.

It is urgently recommended that future extensions or increases of load be anticipated when possible, and that provision be made for them in the initial installation, particularly in the installation of services, main feeders, and distributing centers. The cost of making such provisions in the initial installation is usually small as compared with the cost of future reconstruction or replacement.

NOTE—(*There is so much real food for thought in the above that we could not refrain from reprinting it for the benefit of any one contemplating the installation of electrical work.*) P. E. MOTOR CO.

HERE IT IS BOILED DOWN

THE NEW RULES

DO NOT SERVE AS A SPECIFICATION

THEY ONLY PRESCRIBE MINIMUM REQUIREMENTS

COMPLIANCE WITH THEM DOES NOT NECESSARILY MEAN A SATISFACTORY JOB

PROPOSALS WHICH SIMPLY SPECIFY COMPLIANCE WITH RULES MEAN NOTHING AS REGARDS THE VALUE AND WORKABILITY OF THE JOB

HOW TO BE ASSURED OF THE PROPER KIND OF JOB.

A FEW LINES OF ADVICE WHICH WILL SAVE YOU TROUBLE AND MONEY, IF HEEDED.

Inside pages of circular issued by Pacific Electric Motor Company, Oakland, Calif., and designed to stress the need for better electrical work. The left page is a reprint from the Rules Governing Electrical Construction in Oakland, and the right page sums up the meaning of the rules. This circular has been distributed in large numbers to those who may have occasion to require electrical work.

custody of postal employees. The doors to the individual letter boxes shall be secured by satisfactory locks, with a sufficient number of key changes to prevent the opening of other letter boxes by the use of the key of any letter box. Each receptacle shall be identified by a number and shall have affixed to the interior where it can easily be read by the carrier when the master door is open, a list of the names of the persons receiving mail through such receptacles. All receptacles must be of sufficient capacity to receive long letter mail, as well as certain magazines which are approximately 18 in. in length. The minimum permissible length of mail to be received is 12 in.

It is specified that groups or batteries of mail receptacles should be as large as consistent with space available for construction, but in no case shall there be less than 6 such receptacles in each group, except where the number of apartments is less than 6. Receptacles are required to be placed so that they will be adequately lighted and the owners or managers of apartment houses are required to keep these receptacles in good repair. It is permissible to combine telephone units with mail receptacle units, provided that access to the telephone unit is not dependent upon entering the mail receptacle, and the mail receptacle must not be accessible when the telephone unit is open. The master lock shall not be more than 5½ ft. from the floor. Where it is necessary, in installing apartment house mail receptacles in conjunction with the installation of the telephone unit of standard size, to place the receptacles in two tiers, they may be placed in groups or batteries of less than 6, if required for the proper group arrangement. This, however, applies only where it is desirable to install a telephone unit in connection with the mail receptacles, and does not apply to cases where the telephone unit is installed independently of mail receptacles. These instructions became fully effective Sept. 1, 1924, and govern all apartment houses, family hotels and flats constructed after that time, or substantially remodeled to the extent that a material change in the location of the mail receptacles is involved.

A list of approved receptacles may be obtained on application to the Post Office Department.

Model Electric Home Exhibited in Petaluma, Calif.

"All the comforts of home" becomes something more than a mere saying when the home is electrically equipped. This was effectively demonstrated in Petaluma, Calif., recently when the Cornick Electric Company, electrical contractors of that city, exhibited an eight-room electric home.

Equipment in the kitchen consisted of an electric dishwasher, automatic range, water heater, percolator, table stove, iron, beater, and blower ventilator with reversible fan motor. In the laundry were a washing machine and ironer. A grill, toaster, percolator urn set, waffle iron, fan and wall type heater were among the appliances in the dining room, while the living room was equipped with radiola, floor lamp, fan, and wall type heater. Two of the bedrooms were furnished with electric steam radiators and the third with a portable heater. All three were well equipped for convenience and comfort with warming pads, curling irons, fans, and immersion water heaters. Portable heaters were supplied for the library and bath, and an electric sewing machine was a feature of the sewing room. Tasteful lighting fixtures and wall brackets provided adequate illumination throughout, supplemented by floor lamps. Two vacuum cleaners were included in the household equipment.

Five meters—the master meter and one for cooking, one for air heating, one for water heating and one for lighting and appliances—were installed, with the idea of obtaining accurate data on the cost of operating an electrically equipped home. Tully R. Cornick of the Cornick Electric Company believes that the figures eventually secured will be of material assistance in overcoming the sales resistance so often encountered in the sale of heavy duty electrical equipment.

The home was kept open for eight days, and during that period over four thousand people visited it. On one day a lecture on cooking by electricity was given by J. C. Douglas, representative of the Edison Electric Appliance Compaiy, which attracted an attendance of over four hundred. No effort was made to solicit orders for any of the appliances displayed, but visitors were personally conducted through the house, and the installation and the advantages of the various devices were explained in detail.

Advertising and publicity in connection with the exhibit were handled by Fred W. Rea of the Pacific States Electric Company, San Francisco, Calif.

How to Make Wrapping Counter Create Additional Sales

The average customer probably spends more time at the dealer's wrapping counter than in any other part of the store. It is quite surprising therefore to note that many dealers fail to take advantage of this fact, and make no provision to command the customer's attention while the package is being wrapped. Some dealers, however, have taken it upon themselves to put circulars and display racks at the wrapping counters, and others have arranged displays of the smaller items of merchandise. The space immediately adjoining the wrapping counter is of material assistance in promoting lamp sales. An adequate display of the various sizes and types of Mazda lamps at such a location will always attract attention. Once the consumer's interest is aroused, it is a simple matter to make a sale.

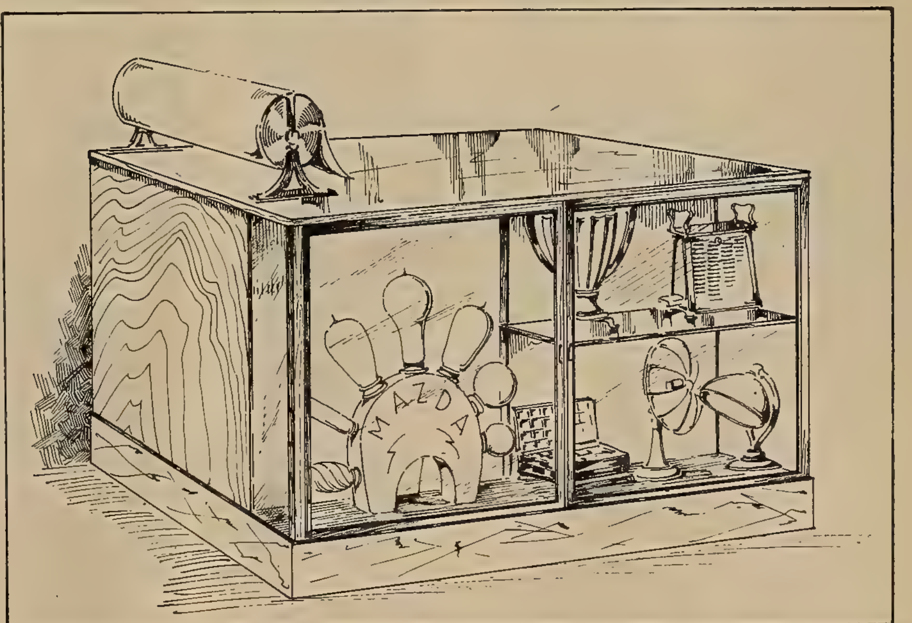
By using these display cases for exhibiting convenience outlets and other auxiliary devices, the contractor-dealer can work up a considerable volume of additional wiring business.

Electrically Equipped Cafe in Utility's Former Home

The former office building which for more than twenty-five years housed the offices of the San Diego Consolidated Gas & Electric Company, San Diego, Calif., was bought recently by two well known restauranteurs of that city. Because of the nature of the use to which it was formerly put, it has lent itself admirably to complete remodeling as a modern, well equipped dining place. The restaurant, known as the Cabrillo Cafe, was opened recently.

Electrical appointments of the new cafe are numerous. The private bakery, located in the basement, in what was formerly a substation, is entirely electrical. An electric baking oven, electric mixers, and, nearby, the private ice plant are all logical consequences of the former use of the building. The kitchen is equipped with many electrical conveniences, as well as apparatus employing gas and steam, the other two products sold by its former occupant.

Lighting of the large dining room, the mezzanine floor, the banquet hall and dancing salon and private dining rooms on the second floor, has been designed with a view to tastefulness as well as utility. Electrical installation under the new owners was made by the Southern Electrical Company.



Shallow show case built under wrapping counter and used for display of merchandise and wiring devices. By showing convenience outlets, radio outlets and other auxiliary equipment, dealers open up avenues to additional wiring business.

BETTER MERCHANDISING

Demonstrate Electrical Devices in Modern Home

First Electric Home in Aberdeen, Wash., Gives Dealers an Opportunity to Display Electric Equipment

By F. P. THOMAS

Demonstration of the adaptability of electrical devices to tasks of the housewife continues to be one of the best means of selling this class of merchandise. This undoubtedly is the reason for the popularity of the electric home, not only in the West, but in all parts of the United States where the electrical industry is anxious to increase the use of electricity and electrical labor-savers.

The fully electrified home has ceased to be a curiosity, and, as such, a thing to be looked upon as something nice to have but not to be enjoyed by the average home-owner. Effective educational campaigns, followed by equally well directed sales drives, have done much to inform the public that electrical comforts can be had at small cost compared with the added advantages that are secured. The original electric homes were largely regarded as "freaks" which had been prepared merely as settings for a large quantity of electric equipment that had no place in the average home. Consistent advertising and salesmanship have now convinced the housewife that to get the most out of life she must employ electrical devices in her home.

Typical of the modern electric home is the one recently displayed in Aberdeen, Wash., by the electrical industry of Aberdeen and Hoquiam. The home was built for an individual who agreed to allow it to be displayed to the public for a period of five days. The home was erected according to the plans of the owner, the only difference from the usual procedure being that all contractors were informed that the home was to be displayed for the specified period. As the home was to be a model one electrically, the contractors of Aberdeen cooperated in offering suggestions and criticisms of the specifications and plans for the wiring of the house. In this way the installation was the result of the combined judgment and experience of the electrical contractors and represented what they considered an ideal and practical arrangement of wiring outlets and fixtures for a modern home. The idea of the committee in charge of presenting the display was to present a home installation which could be looked upon as completely modern and one in which the value of electrical devices could be shown easily.

Preparations for this demonstration of the value of electricity to the housewife were all made prior to the time that the home was ready for display, and such care was taken in the laying of the plans that when the home was opened and visitors were admitted it was found that nothing of moment had been overlooked. Salesmen, acting as guides, were on hand all of the time that the house was open to the public and were ready to take groups of ten or twelve persons through the modern home. By limiting the number of persons admitted to a group, the salesmen were able to give individual attention to the visitors and were thus able to demonstrate the exceptional advantage of the electrical equipment installed in the house.

Instead of admitting the visitors at the front door, as has been the practice in many electric homes, a route was devised that started at the back door, led through the laundry, then to the kitchen and finally to the bedrooms and front part of the house. By taking the guests through the laundry and kitchen first, the committee capitalized upon the interest of the visitors, which was of course keenest upon first entering the house, and then finished the tour with the living rooms, which were more decorative. Another advantage of visiting the kitchen in the early part of the tour was found to be that the guests were ready and eager to spend more time in the first rooms that they entered than they were in those toward the end of the inspection trip. In this way the salesmen were given an excellent opportunity to demonstrate the many labor-saving devices that were installed in the laundry and kitchen, and yet when the groups arrived in the dining and living rooms they were also interested in the decorative fixtures and variety of lamps that were displayed there.

In addition to giving the visitors short lectures on the electrical equipment placed in each room in the house, the committee presented each guest with a souvenir booklet directing attention to the electrical conveniences in the home and giving suggestions to be followed in building a home or in purchasing a ready-built house.

During the five days that the home was open to public inspection, 3,157 persons visited the display and were shown the place of electricity in the modern home. Talks calling attention to the particular features of each room varied from two and one-half to four minutes, according to the number waiting and the interest evidenced by the group.

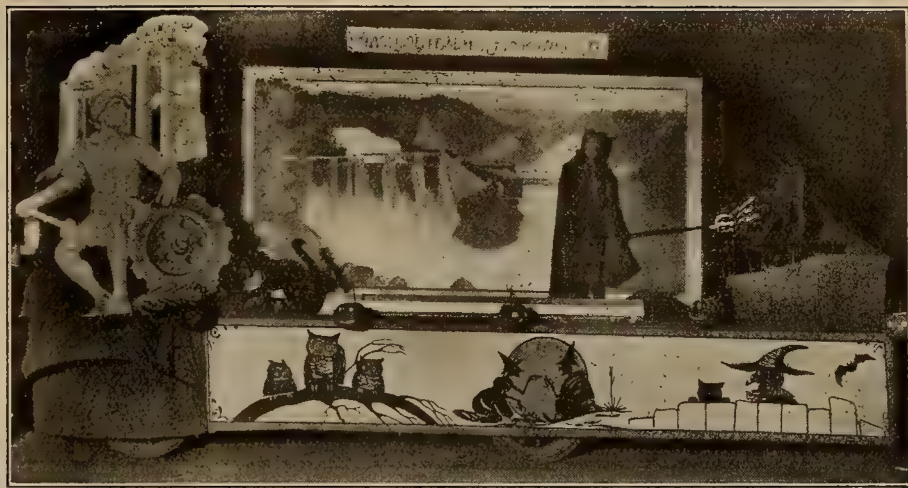
The souvenir booklet presented to each visitor supported itself through advertising paid for by local concerns interested in home-building. Other expenses involved in the display of the home were divided among the Grays Harbor Railway & Light Company, the electrical contractors and dealers of Aberdeen, and the company outfitting the home with furniture. The electrical firms entering in the sponsoring of the display were: A. B. C. Appliance Company, Arrow Electric Company, Electric Shop, Hoquiam Electric Company, Pacific Electric Company and Phillips Electric Company.

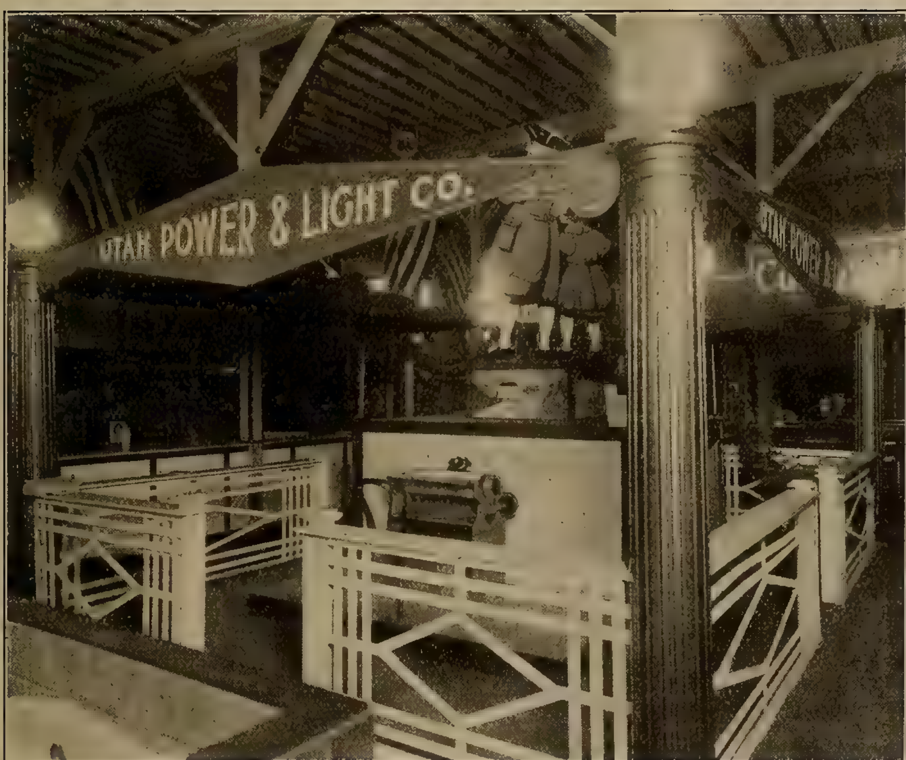
The kitchen was equipped with many modern labor-savers. Guides explained the utility of each device.

Institutional Advertising That Increased Business

Sales stimulating methods used by Western electrical dealers and central stations vary considerably with the time of year and with the general character of the territory served. On this page are shown three ideas used by Western companies to stimulate sales and to keep their names before the public.

The upper picture shows the float of The Washington Water Power Company that appeared in the Hallowe'en Parade held in Spokane, Wash., the evening of Oct. 31. This parade is an annual affair and is sponsored by the commercial and industrial enterprises of the city.



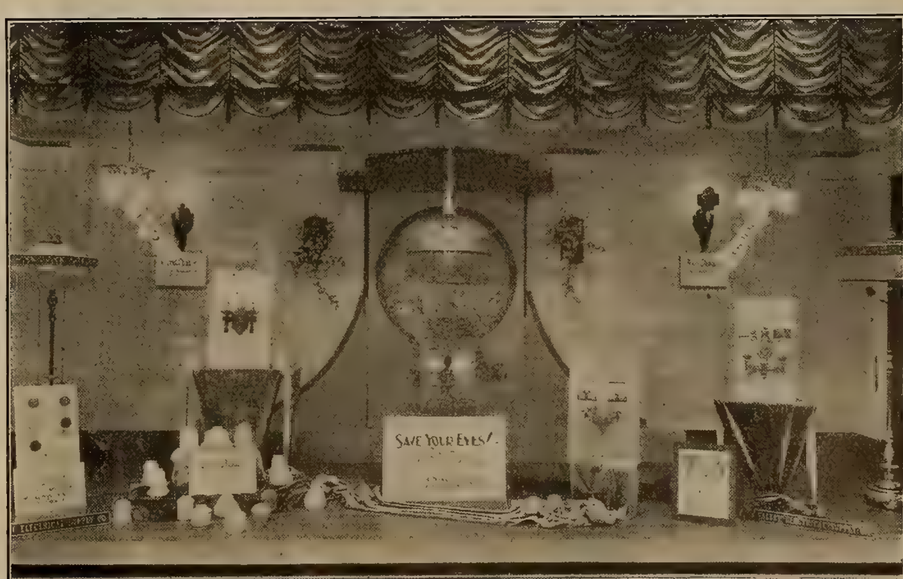


The float used by The Washington Water Power Company was mounted on a truck and as may be seen was designed to call the attention to the Long Lake development of the company. This plant was represented by an attractive oil painting which was illuminated by border footlights and was surrounded by appropriate Hallowe'en designs. On the forward end of the truck there appeared the figure of a man representing power. Electrically illuminated pumpkins also were placed around the float. The feature of the company's entry was the devil, armed with an electric fork with which he made jabs at a black cat. The man, representing the devil, would thrust his fork, which was wired from one terminal of a special laboratory high tension coil, at the black cat, which was connected to the other terminal of the coil. As soon as the fork neared the cat's head, blue sparks 6 in. long would pass between the two conductors, giving the display an exceptional appearance. The high tension coil was supplied with current by a small 120-volt motor-generator set driven by storage batteries.

A different type of institutional advertising was used by the Utah Power & Light Company at the Utah State Fair, held in Salt Lake City, Utah, the first part of October. This company used one of the largest booths available at the fair and decorated it so artistically that the second prize for attractive displays was awarded to the company.

The exhibit was designed to trace electricity from its source, through the power station to the labor-saving devices used in the modern home. At the top of the booth appeared Benjamin Franklin with his kite. An electric power plant was reproduced in miniature, and around the base of the central stand were grouped various appliances. The $15,000 electrical home, to be given as first prize in the Home Lighting Contest, was also featured in a miniature display.

During the Better Home Lighting Contest, the Valley Electrical Supply Company of Fresno, Calif., used its window display space to attract attention to the contest and to show the need for better home illumination. The window display shown at the lower right was exceptionally efficient in aiding the company to broadcast the better lighting message and no doubt was largely responsible for the success achieved in the Better Home Lighting Contest in Fresno. One of the features of the display was the method of showing good and bad lighting.



A down payment of $1 was featured by the Public Service Company of Colorado in a recent campaign on electric washing machines. The balance due on the machine was prorated over sixteen months. Window displays, similar to the three shown on this page, were found to be excellent means of interesting the public. Salesmen capitalized upon the interest aroused by displays and advertising.

Goof, the Get-Byer, Spurns Fortune's Ambassador

By Joe Osier

Ol' Man Opportunity, a dejected figure of a beaten man, hobbled down the road into the dusk, nursing a set of bruised knuckles, for—

"Goof Spurns Opportunity's Call."

Interior of living room of Salt Lake City's third electric home that was visited by 7,500 people during the nine days that it was open. The home was built for sale by a contracting firm, and arrangements were made by the electrical industry of Salt Lake to display it as an electric home.

He had just completed a full eight-hour shift at the door of I. M. A. Goof, a man of the electrical industry, who, let it be heralded, had refused to give him a tumble.

True, Goof had heard the summons; in fact, he had been afraid that Opportunity's banging would split the panel of the door, but,

Because he was busy cussing his hard luck, and manufacturing rain, he turned a deaf ear to the entreaty, saying—

"Why should I answer that old fool's knock? What do I want with Opportunity? I have had plenty of it in my time, and what did it get me?

One of the bedrooms of the Salt Lake City electric home. Particular attention was paid to the lighting as at the time of the exhibit the Better Home Lighting Contest was in progress. The committee in charge of the display included: E. H. Eardley, manager, Eardley Electric Company; G. R. Randall, manager, Salt Lake Electric Supply Company; L. B. Johnson, General Electric Company; E. A. Evans, Westinghouse Electric & Manufacturing Company.

"More work, more responsibility, more worry."

And so Fortune's ambassador slipped away into the night, the while making ready to resume the siege at some other man's door, and

Goof, the welcomer of woe, invented a few more invectives to spring on the Chamber of Commerce crew at the next luncheon.

Each day, so the fable goes, Opportunity ankles forth gaily, eagerly seeking for the doors of men who await his summons.

This knock, if answered, it is said, means that defeat will be changed into victory; despair transformed to gladness, and misfortune to success.

He brings a message of joy to the down-and-outer, breathes the breath of life into projects long dead, and presents a welcome to ones on the way to the heights.

And for his gifts, he asks nothing but sincere effort, honest purposes and lofty ideals.

The boon he bestows cannot be bought, nor can it be obtained through influence. It is a gift—a free-will offering proffered to those who by their actions have shown that they are ready and right to receive it.

Of course, even Opportunity makes mistakes and places his pearls before swine, as—

Witness the case of I. M. A. Goof, but ordinarily he picks his man, who in turn—

Clasps the chance to his bosom and starts running toward the heights, where lie ambitions fulfilled and achievements attained.

So let this be your motto:

"Answer all knocks, they may be boosts."

NEWS OF THE INDUSTRY

Second Unit Is to Be Added to Valmont Steam Plant

To meet the expected demand for electric power in Colorado cities and the Moffat Tunnel, when completed and electrified, the Public Service Company of Colorado is planning to double the capacity of the present power plant at Valmont, near Boulder, by adding a second unit to cost approximately $750,000, according to H. H. Kerr, superintendent of the electrical department of the company. The first unit of 20,000-kw. capacity was put in service Nov. 30, 1924. (Journal of Electricity, Dec. 15, 1924, p. 456.)

A dam, to be 3,500 ft. in length with five subsidiary dams, to cost approximately $1,100,000, also is planned. Construction on both projects will be started in the present year, probably by late summer or fall, according to Mr. Kerr, inasmuch as bids have already been requested.

A third unit will be added to the Valmont plant in 1928 or 1929, according to present plans of the company. Construction of this unit, however, may hinge on whether or not the entire Moffat railroad is electrified between Denver and Tabernash.

According to C. A. Semrad, vice-president of the Public Service Company, the decision to complete plans immediately for additions to the Valmont plant, which has cost $5,000,000 to date, was made following the rapid development of the use of electrical power in northern Colorado. With the completion of the second unit the plant will have a capacity of 50,000 kw.

Final decision was made by Doherty officials last week as the result of a conference in New York attended by C. N. Stannard, vice-president and general manager of the company, G. W. Faller, assistant vice-president, J. E. Loiseau, secretary, and V. L. Board, general superintendent.

Policy of San Joaquin Company Will Not Be Changed

The San Joaquin Light & Power Corporation will remain strictly a local company and will be operated by local men, according to H. P. Wilson, president of the Western Power Corporation which recently purchased the control of the Fresno utility. No change in policy or personnel is contemplated, states the holding-company executive.

Mr. Wilson has also announced that A. G. Wishon, now vice-president and managing director of the San Joaquin company, will be elevated to the presidency of the company and that A. Emory Wishon, at present general manager, will remain in his present position and will have additional responsibility as vice-president. A. G. Wishon has been actively in charge of the power company for twenty-two years.

California Electrical Bureau to Replace "Coop. Camp."

Basic changes affecting materially the California Electrical Cooperative Campaign were adopted at the meeting of the advisory committee of that organization held at Del Monte, Calif., Feb. 1. At this meeting the committee, deciding that there was a need for an electrical educational and promotional organization that would provide constant contact with the general public in California, officially changed the name of the organization from the California Electrical Cooperative Campaign to California Electrical Bureau. It was felt that the "Campaign" period had been passed and that there was a need for a permanent electrical organization.

Other changes in the association's activities involve the programming of activities for a three-year period and the inclusion of new representatives from jobbers and dealers. The changes were sanctioned by an unanimous vote of the advisory committee.

The official announcement issued by the California Electrical Bureau is as follows:

> So rapid is the progress of the electrical industry in California that there is need of a constant contact with the general public by some neutral educational representative of the entire industry.
>
> For the past seven years that need has been filled by the California Electric Cooperative Campaign.
>
> Now, however, it is realized that the greater the growth of the electrical industry the wider is the potential scope of such an organization's activities; and the greater the field of its accomplishments.
>
> Anticipating the broad achivements which the future holds for the electrical industry of California, and believing that the permanence of the industry merits a permanence in its representative organization, the advisory committee has expressed the opinion that the "Campaign" period has passed and, therefore, announces that the name of the California Electrical Cooperative Campaign has been officially changed to
>
> CALIFORNIA ELECTRICAL BUREAU
> Educational Promotional
>
> Offices will be maintained as before at 314 Rialto Building, San Francisco; 631 Cotton Exchange Building, Los Angeles, and 1229 Broadway, Fresno.
>
> Two other basic changes involved in the above decision are as follows:
>
> The programming of the Bureau's activities over a three-year period, with the establishment of a definite goal to be worked toward during that entire period.
>
> The inclusion of new units among those represented by the Bureau by extending invitation to participate to wholesalers and retailers who have not heretofore contributed or had representation upon the advisory committee.

Edison Company to Build Substation at Arcadia, Calif.—Construction has been started on a 1,500-kw. substation to provide an ample supply of power for the Monrovia-Arcadia district of the Southern California Edison Company. The plant will be located at Lower Azusa Road and El Monte Street just adjoining the southern and western city limits of Arcadia and will be known as Anita substation. It is expected to be in operation before the end of March.

Disposal of Colorado Springs System Is Completed

The municipality of Colorado Springs, Colo., has taken another step looking toward the ultimate absorption of all electric interests of the company formerly serving that community. The franchise of the Colorado Springs Light, Heat & Power Company expired Sept. 8, 1923, (Journal of Electricity, July 15, 1923, p. 65). Following the purchase of the steam generating plant and distribution lines of the company within the corporate limits of the city at a price of $600,000 in August, 1924, (Journal of Electricity, Aug. 15, 1924, p. 142), the next problem was the service to be rendered the smaller independent communities in the Pike's Peak region.

This was solved Jan. 26 when the bondholders' protective committee of the Colorado Springs Light, Heat & Power Company, headed by George Reilly of Philadelphia, accepted the offer of the city to purchase outright all other electric interests outside the city for $250,000.

Action resulted at a conference between the two interests and James H. Causey, Denver capitalist and investment banker, who is to take over the entire issue of municipal revenue bonds issued by the city for payment on the property. This marks the final disruption of the company's electrical system, the steam heating system already having been closed down because of financial losses. The gas plant is all that remains, and it is understood that Mr. Causey is a probable purchaser of that.

Delivery of the company's interests will be made to the municipality on July 1, by which time the city's new half-million dollar steam generating plant is expected to be ready to tie-in with the present distributing system.

The Colorado Springs company has already closed its commercial office and sales room, all merchandise and appliances having been sold at very low prices during the holidays.

Alleged Electrical Monopoly Is to Be Investigated

Investigations by the Federal Trade Commission of alleged monopolies in the electrical and tobacco industries were ordered on Feb. 9 by the United States Senate. The investigation of the extent to which the General Electric Company or its subsidiaries are alleged to monopolize production, generation or distribution of electric energy, will be made as the result of a resolution prepared by Senator Norris of Nebraska and attached as a rider on the tobacco-investigation resolution.

An amendment calling for an investigation into the existence of national propaganda to discourage public ownership of utilities was attached to the Norris resolution before it was appended to the tobacco resolution.

H. P. Wilson Comments on Great Western-San Joaquin Merger

H. P. Wilson, president of the Western Power Corporation and vice-president of the Great Western Power Company of California, in an interview with a member of the staff of the Journal of Electricity during his recent visit to San Francisco, declared that the purchase by the Western Power Corporation of the San Joaquin Light & Power Corporation will play an important part in the electrical development of California.

The two systems, he stated, are ideally situated for interconnection, and the load characteristics and potential possibilities of the territory served are such that the purchase was but a natural step in the ultimate development of the properties. According to Mr. Wilson, there is available on the two systems a total of 1,000,000 kw. in potential hydroelectric energy, all of which will possibly be developed within the next ten or twelve years provided the growth of the state continues as it has in the past.

Engineering studies are being made at the present time, he said, which will determine the future power-development program. He believes that the systems have sufficient installed generator capacity to carry them through the present year. In the meantime, however, work will proceed on the raising of the Big Meadows dam at Lake Almanor and upon the construction of a tie-line between the two systems. Definite announcements regarding both of these developments will be forthcoming within a few weeks.

H. P. WILSON

Mr. Wilson definitely set at rest rumors regarding the Eastern financial interests behind the purchase when he said, "Neither the Byllesby Engineering & Management Corporation nor the Electric Bond & Share Company have one dollar invested in the Western Power Corporation".

Commenting upon the attitude of Great Western toward the City of San Francisco and the Hetch Hetchy development he said:

"Great Western is not antagonistic toward the City of San Francisco and its Hetch Hetchy development. We feel, however, that the people of that city will recognize the facts and will not make the fatal error of engaging in municipal distribution of electric energy. Rather than engage in an enterprise which, from the outset would be fraught with difficulties incident to political management, I believe that the people of San Francisco will reach the conclusion that the most economic method of protecting their investment will be to distribute the energy through the agency of one or both of the existing utilities serving the city. It rests with the people to decide. If they should vote to attempt such a hazardous undertaking as municipal distribution, this company will of course have to abide by their decision. All that we ask is a fair and square deal to the end that the investors in our securities will be protected.

"I, for one, feel that ownership by the people on a partnership basis is far better than public ownership. That is the policy which will be pursued by Great Western. We want all of the people in the state as our partners. Just how well we are accomplishing this can be judged from the statement that during the month of January approximately $700,000 worth of our preferred stock was purchased on a customer-ownership basis."

Mr. Wilson is very optimistic over the business outlook for California for 1925 and stated that his company is ready to proceed with power development as rapidly as the requirements of service demand.

Premature Blast Kills Four Men In Florence Lake Tunnel

Four men were killed and one was injured Feb. 4 by the premature explosion of a blast of dynamite in the Southern California Edison Company's Florence Lake tunnel nearly 100 miles northeast of Fresno.

According to a statement issued by the company, a number of blast holes had been drilled in soft ground, in which electric firing was not being used. The drilling and mucking crews had left, and the powder crew had gone in to place and fire the blasts. Evidently two fuses were cut too short by mistake and the dynamite exploded before the men could reach a place of safety.

It is not anticipated that the accident will delay the completion of the tunnel, which is expected to be finished between the 15th and 20th of this month.

Order Survey of Skagit Project In Recent Ordinance

As the next step in the Skagit River power development by the city of Seattle, the city council has passed an ordinance appropriating $12,000 to defray the cost of a complete survey of the proposed addition to the present development on the river, to be made by a commission of three Seattle engineers. Coincident with the passage of the ordinance, the council named the following men to compose the commission: William C. Morse, consulting hydraulic and hydroelectric engineer; Stirling B. Hill of the firm of Parker & Hill, consulting civil and hydraulic engineers, and Joseph Jacobs of the firm of Jacobs & Ober, hydraulic engineers. The ordinance provides further for a study of the municipal distribution system by a second commission of engineers with a view to determining its needs. This commission has not yet been appointed. Mayor E. J. Brown has not yet approved the ordinance, but it is pointed out that, in the event of a veto, it may be passed over such veto.

All the basic data on the Skagit project assembled by municipal officials will be turned over to the engineers. Their survey is not expected to require more than three months.

State Power Act Has Bearing On Projects In Oregon

Advocates of the Clear Lake water and power project on the McKenzie River, Ore., are watching with interest the progress of the resolution to be proposed by Senator Joseph, Multnomah County, to the Oregon State Legislature, which would refer to a vote of the people an amendment to the constitution permitting the state to go into the power business. The Clear Lake project was intended primarily to deliver mountain water from this lake, which is near the source of the McKenzie River, to the towns in the low-lying Willamette Valley. Because of the cost of the project it was expected that several towns from Salem to Eugene would unite in a water district. Estimates have been made tending to show that in connection with this project, about 50,000 hp. could be developed and delivered to these towns at a cost that is practicable, and the advocates of the project believe that, if the proposed state power bill eventually becomes a law, the way will be made easy for the realization of their plans to develop their project.

In his message to the legislature Governor Pierce urged the passage of the state power resolution, saying that he believed in this as a principle. He further stated that he advocated the development by the state of the Clear Lake power project, and that he also urged "that everything possible be done to encourage the construction of a plant at Umatilla Rapids (on the Columbia River) for electric and power purposes."

Seeks Abolishment of Colorado Utilities Commission

The abolishment of the Public Utilities Commission of the State of Colorado is asked in a bill just submitted to the Colorado legislature by Senator J. F. Coss of Walsenburg, Colo. In its present form the bill provides for the transfer of the commission's supervisory power to the attorney-general.

According to reports, there is a three-cornered fight behind the promotion of this measure. One angle concerns the present power of the commission to regulate common-carrier bus service on the state highways; another the action of the commission in recently granting a franchise to a company for natural gas distribution over a large part of the state when that company was not engaged in production or sale of oil or gas; and the last is the apparent desire to eliminate commission control in the case of those municipalities not functioning under Colorado's home-rule amendment. This chiefly concerns privately owned electric plants.

It is definitely understood that this is not a so-called administration measure, yet it has an official relationship with the political promotion of cheaper power for Denver and other large cities. Committee action had not been taken on this bill up to Feb. 1.

Railroad Applies for License to Build Transmission Line in National Forest.—The Great Northern Railway has applied to the Federal Power Commission for a license to erect a transmission line thirty miles long in Wenatchee National Forest, Chelan County, Wash., connecting Cascade Tunnel with the railroad's power plant.

The Copco Forum Holds Third Annual Christmas Party

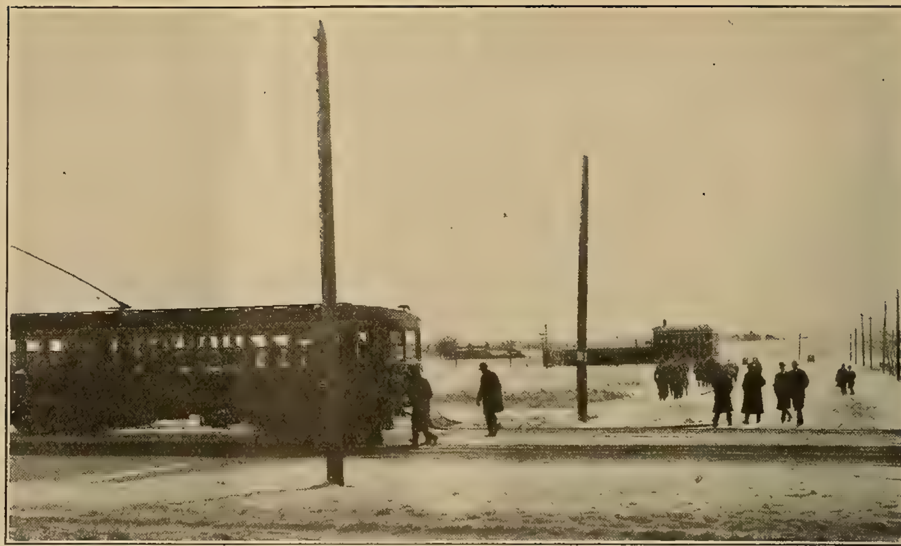
Christmas has come and gone, but the memory of it will linger long with those fortunate ones who attended the third annual Christmas party given by The Copco Forum. The Copco Forum is an organization composed of the employees of The California Oregon Power Company, Medford, Ore., and each year just before Christmas it gives a party which is sponsored and financed entirely by members of the organization and is given wholly independent of any assistance from the company. Plans for the affair are under way all through the year, and funds are raised from various Forum activities to help defray expenses.

The 1924 party was given on Dec. 20, and started off with a big turkey dinner at the Hotel Medford. An attendance of 375, including 150 children who were guests of The Forum, filled the main dining room and the small grill room, and it was even found necessary to place a number of tables in the ladies' parlor to accommodate those who came late.

During the dinner, ushers passed up and down the long tables with fancy party caps of every color and design which were immediately donned by young and old. These were followed by the distribution of horns and noisemakers which were put in use at once, offering keen competition to the orchestra which dispensed popular song hits throughout the meal.

After dinner was over, the party adjourned to the new Copco office building, which had been completed just in time to be dedicated by the Christmas party. Here Santa Claus, who was stationed beneath a huge Christmas tree, proceeded with the distribution of presents to the eager kiddies. Each child received a handsome present and a bag of candy, nuts and fruit. The presents had been carefully selected by the committee in charge of that detail and consisted of such substantial gifts as real watches, roller skates, baseball outfits, footballs, dolls, doll buggies and sewing outfits. Needless to say, the children were all delighted with their gifts, which presented conclusive evidence that there "really is a Santa Claus."

The kiddies thoroughly enjoyed the dinner which was one of the features of The Copco Forum's Christmas party.



KOA new broadcasting station of the General Electric Company at Denver. One of the new street cars, recently put in service in Denver, and a group of utility men who visited the station may be seen in the background.

Denver Broadcasting Station Is Model Installation

Building material and equipment used in KOA, the new General Electric broadcasting station at Denver, Colo., if loaded on freight cars, would require a train forty cars long and heavily loaded, according to estimates of the constructing engineers. The station went on the air Dec. 15, 1924.

Approximately ten and one-half miles of copper wire ranging in diameter from the size of a needle to an old-fashioned clothes pin were required in the construction, in addition to a mile and a half of electrical conduit. Other items include 100 tons of structural steel, 2,500 sacks of cement, 127,000 brick, 65,000 bd. ft. of lumber and 485 cu. yd. of cand and gravel.

Each of the two towers which support the antenna system weighs twenty tons and is embedded in sixty tons of concrete. They are triangular in shape and 260 ft. apart and support the antenna which is 120 ft. long and 150 ft. above the ground.

Sleet and snow may be melted from the antenna system during winter months by causing a high current to flow through the antenna wires, thus raising the temperature, according to Harry Sadenwater, engineer in charge of radio technical operations for the General Electric Company, who supervised the construction of KOA.

The antenna is a multiple-tuned type with two down leads. Each of the three flat top cables consists of seven strands of silicon-bronze wire. Spreaders which support the antenna are 24 ft. long and are suspended by steel bridles from 4-ft. porcelain insulators. The counterpoise, which replaces the usual ground connection, is 17 ft. above the ground and is held in place by fifteen steel supports. As in the case of the antenna, one lead connects with the power plant in the rear of the studio building and generator room and the other with the tuning house. On account of high frequency, all steel and iron throughout the studios and power house and generator rooms have been grounded.

KOA marks a departure from the usual circuit arrangements in that a master oscillator-circuit is utilized to assist in obtaining constant frequency for transmission and freedom from harmonics. Two sets of transmitting equipment are installed and may be placed in service at once. This assures continuous operation should one set break down.

In the control room, which separates the principal studio and the speakers' studio, are three stages of speech amplification, made up of one 5-watt tube and two 50-watt tubes. A fourth stage is provided in the power house. The power tubes are the UV 207 type and are water-cooled.

For the present KOA will operate on a wave length of 323 meters. The power rating will be 1,500 watts. Credit for the installation of the new broadcasting unit at Denver is being given to H. D. Randall, Rocky Mountain district manager for the General Electric Company.

Street-Lighting System Installed in Small Idaho City.—The town of Minidoka, Ida., has recently completed the installation of a modern street-lighting system, which makes it one of the best lighted cities of its size in the West.

Grays Harbor Company Files on Two Washington Sites

Two applications for permission to divert water from Washington streams for the purpose of hydroelectric development have been filed with Washington officials by the Grays Harbor Railway & Light Company of Aberdeen. The first is for rights on the Wynooche River in Grays Harbor County on virtually the same site as chosen by the city of Aberdeen for a municipal plant, and the other is on the Hoh River in Jefferson County.

The Wynooche River project calls for an appropriation of approximately 500 sec.-ft. of water, which will be used at a 200-ft. head. An application for a reservoir site in the Weatherwax Basin, capable of storing 80,000 acre-ft. of water, accompanies this application.

The estimated cost of development is placed at $1,700,000, and the capacity of the plant is estimated at 10,000 hp. The impounding dam is to be 150 ft. high, 300 ft. wide on top and 50 ft. wide on the bottom, and will be of concrete construction. The main canal is to be two and one-half miles long.

A temporary permit is held on this site by J. E. Malinowski, who has 60 days from Jan. 6, 1925, in which to begin construction work, under a notice issued by the state hydraulics department. The city of Aberdeen, which was to have received assignment of the permit, was prevented from developing the site when the courts declared illegal an election authorizing a bond issue of $2,000,000 for financing the project. (Journal of Electricity, Dec. 15, 1924, page 457.)

The Hoh River plant, on which only partial details were given in the application, calls for an appropriation of 4,000 sec.-ft. of water, which will be used at a 50-ft. head, generating 20,000 hp. The cost is not estimated nor was there a reservoir application filed. Details of the diversion dam were also lacking.

San Diego Company Occupies New City Garage Building

Repair shop of the new garage of the San Diego Consolidated Gas & Electric Company.

Placed in service just before the holidays, the new garage building of the San Diego Consolidated Gas & Electric Company, San Diego, Calif., located near the pioneer Station A, constituted for that company something of a Christmas present. Not only does the new unit provide storage space for the increasing numbers of pieces of transportation equipment, but the evacuation of the former garage has made it possible to enlarge the floor space of a number of shops which have long felt the need for more room.

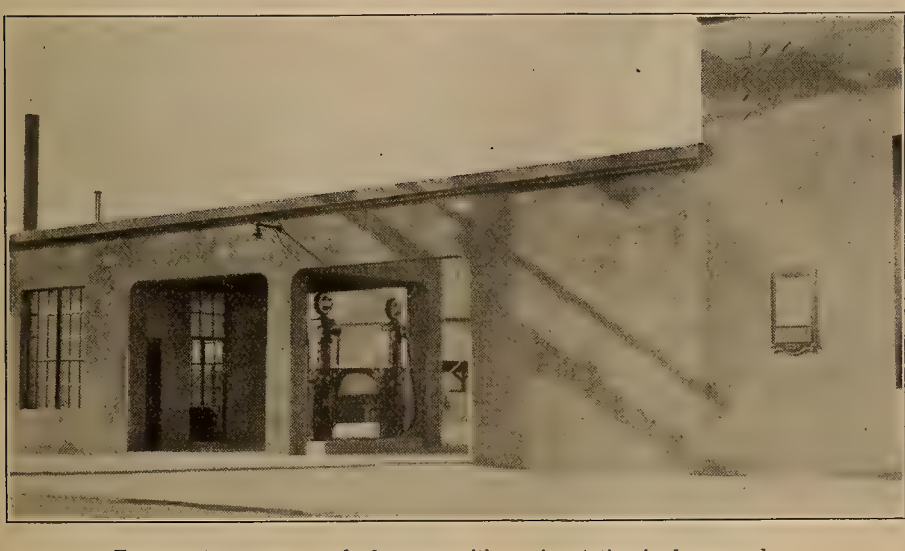
The new garage is located near the gas plant and takes the entire frontage of L street between Ninth and Tenth. Together with the large concreted yard which is enclosed by the service station, the garage utilizes half of the block. Offices of the garage and transportation clerks are located on the main floor at Tenth and L streets, with a private office for C. D. Weiss, the superintendent, at the corner. Upstairs are large storage rooms for supplies and files.

Next to the offices is a well-equipped repair shop. Two pits run lengthwise of the shop and make provision for work on as many as six cars or trucks at a time. An overhead traveling crane makes it possible to carry heavy pieces of equipment to any part of the shop. Numerous special pieces of tool equipment, such as work benches, are conveniently placed, and daylight is abundantly furnished through skylights and large fenestral windows opening on the street. The repair shop itself opens only on the yard.

Next to the repair shop is a special tool and stock room which in turn is connected to the storage rooms upstairs by a freight elevator. A feature of the garage is the room provided for tire repair work and for care of batteries. In it is a large hood which is designed to carry off battery fumes. Batteries are charged by means of a direct-current motor-generator set.

The large room for the storage of cars is equipped with roller doors opening on both the yard and the street and is deep enough to store four trucks in a row the entire width of the garage. Special oil-draining pits, car-washing stalls and other features are provided in this section of the building.

Of reinforced concrete construction throughout, the building is finished in cream-colored stucco, in conformity with the general plan adopted by the company for its buildings, and is decorated with green tile.



Entrance to concrete yard of garage with service station in foreground.

Seattle Commercial Lighting Rates Reduced.—The Seattle city council, on Feb. 9, passed an ordinance reducing commercial lighting rates on the municipal distribution system from 7 to 20 per cent. The reduction affects stores, buildings, hotels and other establishments in the business section. At the same time the council passed an ordinance over the mayor's veto calling for the appointment of three hydroelectric engineers to make an investigation of the Skagit River municipal power project. The three engineers will be Joseph Jacobs, W. C. Morse and Sterling B. Hill.

Wynooche River Permit May Be Canceled by State

Holding that J. E. Malinowski of Aberdeen, Wash., who was granted a permit in October, 1922, to appropriate approximately 700 sec.-ft. of water from the Wynooche River in Grays Harbor County, Washington, for hydroelectric development purposes, had not properly complied with the state law in the matter of development work, officials of the state hydraulics department have notified him either to begin construction work within sixty days from Jan. 6, 1925, or to show cause why his permit should not be canceled.

The permit in question involves the proposed development by the city of Aberdeen of a municipal hydroelectric plant and the construction of additions to the city water supply at that point, it was pointed out. Mr. Malinowski had assigned his rights on the stream to the city of Aberdeen and the city voted a bond issue of $2,000,000 on Dec. 1, 1923, to finance the plan of development. The department did not accept the assignment, as the matter was in the courts at the time, it was stated. The courts have prevented the city from going ahead with the project. (Journal of Electricity, Dec. 15, 1924, p. 457.)

It was intimated by officials that the present cancellation is but a forerunner of others which are to follow in cases where applicants have not pursued proper diligence in developing sites on which they have received tentative permits. It was further intimated that permits would not be issued in the future unless the applicant could show reasonable proof that the permit was being sought in good faith.

Request Bids for Cushman No. 1 Transmission Line

According to announcement of Ira S. Davisson, commissioner of light and water, Tacoma, bids will be received in February for the material and erection of the transmission line and switch towers, including the "Narrows Span" crossing Puget Sound, in accordance with section "L" of the specifications for the Cushman No. 1 power project now under construction by the city of Tacoma.

J. L. Stannard, chief engineer of the project, on return from a recent inspection of the work, stated that the dam is progressing satisfactorily, that the lining of the tunnels with concrete has been started, and that all but 2½ miles of the right of way for the transmission line between the plant and Hoods Canal has been cleared.

New Mexico Utility Will Erect New Steam Plant

Construction of a new steam generating plant for the Albuquerque Gas & Electric Company, Albuquerque, N. M., is to be started early this year, according to a statement recently made by Arthur Prager, manager of the company. The new plant, which will be built at Bernalillo, about 20 miles northeast of Albuquerque, will be operated in conjunction with the present steam plant in the latter city, to which it will be connected by a high-voltage transmission line.

Tentative plans cover the building of a steel and concrete, fireproof power house with an initial plant installation of 7,500 hp. Steam pressure will be about 400 lbs. per sq.in. Design and construction work will be in charge of the engineering department of the Federal Light & Traction Company of New York, of which the Albuquerque company is a subsidiary, and the new power house is expected to be ready for use by early fall of this year.

Coincident with the announcement of plans for the new plant, a reduction of rates was made, effective in January. The lighting rate was reduced one cent, making the new rate 12½ cents per kw-hr. in the first block and 8 cents per kw-hr. in the second. Reductions in the general large power, general small power, and miscellaneous power rate schedules also were announced.

Bridge River May Be Developed by B. C. Electric Co.

The purchase of the power site and permits of the Bridge River Power Company on Bridge River in British Columbia is being considered by the British Columbia Electric Railway Company, Ltd., of Vancouver. An extensive survey and investigation of the potential power possibilities of the project have been made by the Vancouver utility. It is understood that the directors of the company will decide during the present year whether to purchase the Bridge River site or to install an additional plant on Stave River.

The Bridge River site (Journal of Electricity, Feb. 1, 1925, p. 88-9) is estimated to have an ultimate capacity of 335,000 kw. The proposed initial development of the Bridge River Power Company called for the installation of three 20.800-kva. units to be driven by three 25,000-hp. impulse water wheels operating under an effective head of 1,140 ft.

Jury Fixes Value of Property Condemned by Loveland

The city of Loveland, Colo., must pay the Public Service Company of Colorado $116,227. This is the total amount fixed by a jury in the district court at a hearing held recently at Fort Collins to arrive at a valuation of the company's property in Loveland that the city is taking over by condemnation for use in connection with its recently completed municipal power plant. (Journal of Electricity, Dec. 15, 1924. p. 458.)

Of the amount fixed, $113,350 was set as the valuation of the property taken over, and $2,877 as damages to the property not taken over. At the hearing, which consumed a week's time, the Public Service Company endeavored to establish the valuation of the property at $160,000 to $165,000, while the city of Loveland attempted to have the figure set at from $83,000 to $90,000.

Application Filed for Water Appropriation for East Bay Municipal Utility District Water-Supply Project.—Application has been made by Stephen E. Kieffer of San Francisco to the Department of Public Works, Division of Water Rights, for permission to divert 200 sec.ft. of water from the Mokelumne River for the generation of hydroelectric energy. The application is made in connection with the proposed project of the East Bay Municipal Utility District to provide a water supply to Oakland, Alameda, Berkeley and neighboring cities.

Lewiston Property Taken Over By Portland Company

Following confirmation by the court of the sale of the properties of the Washington-Idaho Water, Light & Power Company, Lewiston, Idaho, to L. B. Hatch of New York, announcement has been made that this property has been transferred to the Inland Power & Light Company and will be operated by the Pacific Power & Light Company, Portland, Ore. The Lewiston property, which was bought for $1,125,000 (Journal of Electricity, Nov. 15, 1924, p. 378), consists of the light and power business in Lewiston and Lapwai, Idaho, and Clarkston and Asotin, Wash., supplied by two hydroelectric generating stations on Asotin Creek, one of 1,500-kw. and the other of 400 kw. capacity, with a 22,000-volt transmission line connecting the four towns. A further source of supply is furnished through a connection with The Washington Water Power Company, Spokane, Wash., over a line north to Moscow, Idaho. Likewise included in the property is the domestic water system of Clarkston, with some irrigation business.

The Pacific Power & Light Company has commenced surveying a right of way for a 66,000-volt line from Pomeroy, Wash., to Lewiston, a distance of about 30 miles, which will connect the new property to the Yakima-Walla Walla power system of that company. This line is projected for construction next summer.

New Offices for Executives of Great Western Power Company.—Offices of the executives and of the legal counsel of the Great Western Power Company of California in San Francisco are now situated on the fourth floor of the Standard Oil Building, 225 Bush Street. The general offices, including the heads of all departments, will remain in the company's building at 530 Bush Street. The building at 435 Sutter Street, recently purchased by the Great Western company, is rapidly being remodeled, and upon completion will be occupied by the San Francisco division offices, which have been located at 347 Grant Avenue for a number of years.

Telluride Power Company Files Application to Divert Water from Sevier River.—Application to divert 100 sec.-ft. of water from the Sevier River to be used to produce an estimated total of 1,900 hp. has been made to the state engineer of Utah by the Telluride Power Company, Salt Lake City. According to the filing, the water is desired to supplement the capacity of its existing plant. For the same reason the company has filed on 12 sec.-ft. of water from Panguitch Creek to be used to develop 250 hp. in case of need.

Arizona Asks Water Parley.—Concurrent resolutions have been introduced in both houses of the Arizona State Legislature calling for the appointment of a committee of five to meet with committees from California and Nevada for the purpose of adjusting and determining the respective rights and interests of the states in regard to the Colorado River and the Colorado River Compact. The committees would report to the legislatures of the three states.

Pacific Coast Electrical Association

Technical Section Bureaus Report on Meetings

Active Discussion and Important Character of Work Undertaken Reflected in Chairmen's Official Reports

The conclave held by the Technical Section of the P.C.E.A., Jan. 7, 8 and 9 at the Fairmont Hotel in San Francisco constituted one of the most successful series of meetings of this nature ever held. This is true both in the large attendance and in the amount and quality of the work accomplished. All bureau reports have not been submitted for publication as yet, but those which have been completed and submitted by the bureau chairmen are published herewith.

Accident Prevention Bureau

J. M. Buswell, chairman.

Training in first aid and resuscitation, its value to men, to the companies, and to the public alike, and the success of conducting such training through competition were thoroughly treated in a report from Dr. C. E. Mordoff of the San Joaquin Light & Power Corporation. This was read by the chairman, J. M. Buswell of the same company. Discussion followed.

"Safety Bulletins" as reported upon by F. V. Wright, of The Southern Sierras Power Company, evoked discussion and brought out the fact that adequate bulletin service properly handled was decidedly beneficial to all concerned.

A "Course in Accident Prevention for Linemen", published by the N.E.L.A., was discussed, and it was decided that wide distribution of this booklet by all member companies would effect a good foundation for safety training. Study of this, or courses modeled along the lines given in this publication, stimulated by periodic tests and friendly competition between various groups, would nicely balance the semi-technical training now given by several companies to employees to fit them for responsibilities that are growing with the systems. F. A. Brown, of the Southern California Edison Company, was not able to be present to submit a report on this subject at this time.

"Safe Practices" were discussed, and it was agreed that a study of such should go along with an accident-prevention course. W. L. Smith, of the Los Angeles Bureau of Power & Light, was not present to report upon this phase of the work.

Tools, improvised or otherwise, that would lend themselves better to safe usage than some present tools is a subject which S. M. Bullis of The California Oregon Power Company has up for report at the March meeting. Mr. Bullis succeeds H. L. Walther as the representative of that company.

"Forms of Company Safety Organizations", assigned to E. J. Kendall of the Great Western Power Company of California, evoked much discussion. Experiences with various forms were considered and it developed that the local committee form, where the memberships are rotated frequently, is the most efficient, especially when coupled with a definite system for continuous inspection and instruction. Under this system the workers themselves are given definite responsibilities and thus take a more personal interest in safety work.

A standard "Safety Code" is being prepared by the Pacific Gas and Electric Company and V. R. Hughes of that company is to canvass member companies for any codes they may be using now and for suggestions as to the proper scope for an enforcement of such a code.

The establishment of confidence in accident-prevention work and appreciation of its necessity is one of the most important efforts of this bureau. Practical schemes of accident prevention that can be applied in an economical way can be worked out and will prove beneficial to all concerned. Systematic accident records which could be compared between companies from year to year are suggested as aids to the cause.

J. C. Gaylord of the Southern California Edison Company reported on the St. Louis meeting.

Hydraulic Power Bureau

R. M. Peabody, chairman, S. F. Coghlan, secretary.

Mechanical reliability of water power plants was the first subject discussed. This subject is the one assigned to subcommittee No. 1 of the national hydraulic power committee and is sponsored by the Pennsylvania Section of the N.E.L.A. Copies of the questionnaire issued by the Eastern body were distributed and discussed. The information asked for can be obtained, and an effort will be made by member companies to complete the questionnaire before the March conclave.

Hydro plant layout is the main subject of the year for the P.C.E.A. and likewise the subject assigned to subcommittee No. 2 of the national organization. Reports of this subject were submitted by six member utilities as follows:

- Bureau of Power & Light, Los Angeles.
- The California Oregon Power Company.
- Pacific Gas and Electric Company.
- San Joaquin Light & Power Corporation.
- Southern California Edison Company.
- The Southern Sierras Power Company.

High-head plants covered in the reports were of both the turbine and the impulse type operating at heads of more than 400 ft. Turbine plants were Pit No. 1 of the Pacific Gas and Electric Company, Kern River No. 3 and Big Creek No. 3 of the Southern California Edison Company, and San Francisquito No. 2 of the Bureau of Power & Light. Impulse plants were Leevining Creek No. 1, of The Southern Sierras Power Company, San Joaquin No. 1 of the San Joaquin Light & Power Corporation, and Big Creek No. 1 of the Southern California Edison Company.

Medium-head plants operating at heads of from 100 ft. to 400 ft. reported upon were Pit No. 3 of the Pacific Gas and Electric Company, Copco Nos. 1 and 2 of the California Oregon Power Company, and the Kerckhoff plant of the San Joaquin Light & Power Corporation.

The only low-head plant covered in the reports was the Klamath Falls East Side plant of The California Oregon Power Company. Details of these various plants were discussed. Information contained in the reports will be arranged in tabular form for submission as a final report of the activities of the bureau.

Meter Bureau

G. H. Searle, chairman, J. E. Bridges, secretary.

The meter course at the University of California will be held in two sections this year, according to the proposed plans of A. L. Duesbury, Western States Gas & Electric Company, subcommittee chairman. The cost of the course will be $8 per student. To lessen the congestion in the laboratory and to make the course available to a greater number of meter men, the committee will endeavor to arrange for an elementary section to be held at Los Angeles in addition to the two sections at Berkeley.

Nothing was reported this time by E. Ealson, Southern California Edison Company, who heads the subcommittee on the use of oil in meter bearings.

The influence of wave form on relay operation and the best test method by which reliable operation may be obtained are subjects under investigation by the subcommittee on relay maintenance, headed by J. C. Albert, Los Angeles Bureau of Power & Light. Charts were exhibited showing the characteristic curves of three different types of relays when operated on currents of the same effective value but of different wave forms. Shorter time values were obtained obviously with a sine wave than with other wave forms. Further tests and investigation are to be made. Recommendations for a standard system of relay testing will be included in the final report.

Results of tests on a bushing-type current transformer were reported by W. N. Lindblad, Pacific Gas and Electric Company, chairman of the subcommittee on high-tension metering for operating conditions. A German development in bushing-type current transformer using a small amount of iron was reported as having improved characteristics and greater adaptability to smaller amounts of primary current than the usual type. The Niagara current transformer was mentioned, but no members present could report experience with it. A double-winding current transformer designed to be immersed in the oil of a switch tank was exhibited by J. S. Thompson of the Pacific Electric Manufacturing Company.

An inverted current transformer for use in measuring high-tension voltages

was proposed by Mr. Lindblad. In this scheme the leakage current of a string of insulators would be utilized to obtain a meter indication proportional to the voltage of the line.

Data are being collected by the sub-committee headed by C. F. Gilcrest, San Joaquin Light & Power Corporation, on the proper size of meters for various installations. No report was available at this time.

The use of iron-clad installations relative to meter testing as applied to 2,200-volt installations of The California Oregon Power Company was reported by R. S. Daniels of that company. W. R. Frampton, Southern California Edison Company, is chairman of this sub-committee, but was unable to attend this conclave.

New developments were commented upon by W. C. Smith of the General Electric Company, in the absence of J. H. Paget, Great Western Power Company of California, the chairman, and he exhibited a new potential switch. The new "OB" meter was demonstrated by J. E. Bridges of the Westinghouse Electric & Manufacturing Company. This new meter has a modified terminal arrangement. The design of a new multi-range potential transformer having the same curve on all ratios was announced by O. A. Knopp, Pacific Gas and Electric Company. The transformer contains a one-to-one ratio and thus may be calibrated without reference to laboratory standards.

Determination of logical meter-test periods is to be attempted by a new subcommittee headed by T. S. Capek, Pacific Gas and Electric Company. No report on this work was available at this session.

The St. Louis meetings of the Technical National Section held Oct. 20, 21, and 22 were discussed in a report read by W. H. Talbot, San Diego Consolidated Gas & Electric Company.

Pacific Coast practices as of interest to the national meter committee furnished the concluding topic for discussion.

Prime Movers Bureau

C. E. Steinbeck, chairman, C. R. Stewart, secretary.

Discussion of various phases of the technical national prime movers committee as outlined by the chairman occupied most of the time of this bureau at the recent sessions. Assignment of certain subjects to the Pacific Coast section by the national section was confirmed. These subjects are as follows:

1—Utilization of local fuels, methods and appliances.

2—Cooling of condenser circulating water.

3—Continued work on operating code definitions.

Subjects for continued study on the part of the national subcommittee on condensers were suggested as follows:

1—The prevention of algae growth in cooling systems.

2—Surface condenser operation, performance, etc.

3—Electrolytic protection of condenser tubes and stopping of troubles due to ground currents.

Thorough discussion of all six of the above subjects took place at the meeting.

Mechanical oil-burner experiences were reported upon by all member companies. All reports were very complete and will be presented to the national committee for publication.

Steam-plant mechanical equipment was also a subject upon which all member companies reported. Time permitted the discussion of only the report covering the new Long Beach Plant of the Southern California Edison Company.

Inductive Co-ordination Bureau

L. J. Corbett, chairman.

Attendance at this meeting was noticeably reduced, due to the important matters under discussion at other parallel sessions.

Differences in practice in various parts of the country were noted particularly by the chairman in his report of the St. Louis meeting of the national committee. The code of "Principles and Practices" was spoken of as working out well in the East under their varied and unstandardized conditions.

Recommendation that studies of inductive co-ordination matters be placed under the inductive co-ordination committee instead of under separate and independently appointed project committees, as has been done on current work, was made to the national executive committee at the national meeting.

Radio interference is a matter which is assuming importance. This is a new problem confronting the industry, and the co-ordination committee this year will compile data on methods and apparatus used by central station companies for locating power line leaks.

Cooperation of the local bureau with the national bureau is asked in the following ways:

1—Reporting existing parallels with communication lines, co-ordination methods used and results.

2—Reporting cases of radio interference complaints, methods and equipment used, with photographs, and results.

Forms are provided for these reports, which should be sent as early as possible to the local bureau chairman with any comments.

P.C.E.A. Executive Committee to Meet.—The Executive Committee of the P.C.E.A. will hold a meeting in San Francisco on Feb. 19. The meeting will be called at 2:30 p.m. in the office of S. H. Taylor, secretary of the association, 527 Rialto Building.

Book Reviews

ELECTRICAL ENGINEERING

By ALEXANDER GRAY. Third edition. 448 pages; 444 figures. $4. Published by McGraw-Hill Book Company, Inc., New York, N. Y.

This text is based on a lecture and a laboratory course given to the senior engineering students who are specializing in branches other than electricity and who consequently have only a limited time to obtain a broad idea of the principles and practice of electrical engineering. The author states:

For such men it is necessary to emphasize the fundamental principles, and to develop the subject by elaborating on these principles rather than by the solution of mathematical equations, because only in this way can the student be given such a grip of the subject in the short time available, that he is able thereafter to make intelligent use of the data contained in the electrical handbooks, or take up with advantage a further study of the special treatises on the subject.

In this third edition the text has been revised and brought up to date by Professor Gray's assistant at Cornell University, Prof. Robert F. Chamberlain.

In the first few chapters the fundamental principles of electricity and magnetism are briefly discussed and the author then begins the treatment of the practical application of engineering principles covering the subjects of rheostats, magnetic circuits, solenoids and electro-magnets. Direct-current machinery is then taken up, chapters being devoted to the construction of direct-current machines, the theory of commutation, armature reaction, and the characteristics of direct-current generators and motors. Electrolysis, primary batteries and storage batteries are all treated, after which the text takes up the subject of alternating currents, starting with the first principles and followed by alternator construction, transformers, polyphase and single-phase motors, transmission and distribution.

The latter part of the text is devoted to a laboratory course and to problems covering the practical phases of electrical engineering.

While not complete enough to be considered a treatise for electrical engineering students, the book handles the subject of electrical engineering in a thorough manner, and all of the references to machinery apply to the latest equipment on the market. Some of the sections of the book are particularly good, such as the section illustrating the theory of commutation and the section covering alternator construction. To illustrate the windings of an alternator use is made of colored diagrams which assist greatly in showing the student the manner in which windings are placed in modern alternators.

The book should prove quite useful for the purpose intended, that is, to give students who are not specializing in electrical engineering a working knowledge of the principles involved in the construction and operation of electrical machinery. E. R. S.

Electrical Supplies Hand Book Published.—The Associated Manufacturers of Electrical Supplies has recently issued the first edition of its hand book covering general standards in use by more than one section of the association. The book is highly valuable to the manufacturing branch of the electrical industry, as well as to those concerned with electrical inspection, as it contains detailed specifications for various devices in use in the electrical business. The book also contains the roster of the officers and membership of the association.

"The Electrical Manufacture of Carbon Black".—This is the title of Technical Paper 351 issued by the Department of the Interior, Bureau of Mines. It is by J. J. Jakosky and describes the proposed type of apparatus and gives an estimate of the cost of producing carbon black from oils. The price is ten cents, and orders should be addressed to the Superintendent of Documents, Government Printing Office, Washington, D. C.

Meetings

Commercial Programs Discussed at Jobbers' Meeting

The commercial development programs of the two major central stations in California for the year 1925 were outlined before the general meeting of the Pacific Division, Electric Supply Jobbers' Association, at Del Monte, Calif., Jan. 31, by representatives of the Southern California Edison Company and the Pacific Gas and Electric Company. R. E. Fisher, vice-president in charge of public relations and sales of the Pacific Gas and Electric Company, presided. With drought conditions passed and power supply back to normal in southern California the Southern California Edison Company will launch an aggressive load-building program, according to W. L. Frost, general commercial manager of that company. A special effort will be made to secure new customers which will require only service wires and a meter, he stated.

COMING EVENTS

Commercial National Section, N.E.L.A.—
New York, N. Y.
March 17-19, 1925

Southwestern Public Service Association—
Annual Convention—Rice Hotel, Houston, Texas
May 5-8, 1925

Electrical Supply Jobbers' Association—
Annual Convention—Hot Springs, Va.
June 1-6, 1925

Associated Manufacturers of Electrical Supplies—
Annual Meeting—Hot Springs, Va.
June 8-12, 1925

National Electric Light Association—
Annual Convention—San Francisco, Calif.
June 15-19, 1925

The load-building activities of the Pacific Gas and Electric Company this year will be directed primarily toward securing those types of load which will be most beneficial in filling up the valleys in the system load curve, said J. P. Coghlan, assistant to the president of the Pacific Gas and Electric Company. High-load factor, high-power factor, off-peak loads will be those sought to accomplish the desired results. In other words he stated, "our commercial program this year will be of the selective load-building type." With the completion of the Pit No. 3 hydroelectric plant during the summer and the absorption of 25,000 kw. into the Pacific Gas system from the new Copco plant of The California Oregon Power Company early this spring, there will be an abundance of power available for industrial, commercial and domestic uses in northern California, Mr. Coghlan stated.

A resume of the 1924 commercial department activities and a survey of the plans for the coming year of the larger power companies of the eleven Western states, as compiled by the Journal of Electricity, was presented by W. C. Heston, Pacific Coast editor of Electrical World.

The meeting was the annual session of the Pacific Division of the jobbers' association and was unusually well attended from all sections of the West. At the election of officers the following were named for the ensuing year: O. B. Stubbs, Stubbs Electric Company, Portland, chairman; Harry Harper, Western Electric Company, Los Angeles, executive committeeman to sit with the executive committee of the national jobbers' association, and Albert H. Elliot, San Francisco, secretary. In addition to the regular golf tournament for the four cups, much interest centered around the "Calcutta Pool" which was held. In spite of the disastrous fire which destroyed a part of the old Del Monte Hotel during the last jobbers' meeting, Carl Stanley, manager, was able to accommodate the guests in a most satisfactory manner.

San Diego Electric Club Elects Officers for New Year

Herbert Rose, Federal Electric Company representative in San Diego, Calif., was elected to the office of president of the San Diego Electric Club at its annual meeting held Jan. 13 at the Cabrillo Cafe. Hugo Kuehmsted, of the street railway company, the only other candidate, received nineteen votes against thirty cast for Mr. Rose.

Closer contests were staged in the balloting for the offices of first vice-president and secretary-treasurer. Bruno Barth, of the Southern Electrical Company, led his opponent, H. H. Watson, of the Byllesby Engineering & Management Corporation, by one vote. Mr. Barth was elected first vice-president by a vote of twenty-five to twenty-four. C. C. Clardy, electrical contractor, won second vice-presidency by a vote of thirty-seven to thirteen over W. H. Ellison, of the street railway company. Charles Stevens, of the telephone company, defeated the incumbent, Guy Miller, of the street railway company, for secretary-treasurer by one vote, getting the odd count on a twenty-five to twenty-four ballot.

The five men elected to the executive committee are: W. A. Cyr, G. H. P. Dellmann, Al May, W. G. Boyce and Carl Wiggins. Ralph Zink, E. R. Damarus, Sam Hall, Evan Shaffer and Walter Rainey were the other men running.

Equipment Tests Exhibited Before Seattle Club.—The Electric Club of Seattle was recently entertained with moving pictures of tests of electrical equipment, taken for and sponsored by the National Board of Fire Underwriters of Chicago. The showing was under the auspices of the Seattle Fire Department.

New Mexico Electric Light Association Convention Postponed.—The annual convention of the New Mexico Electric Light Association, which was scheduled to be held in Albuquerque Feb. 16-18, has been indefinitely postponed.

Los Angeles Contractor-Dealers to Hold Annual Ball.—The Electrical Contractors and Dealers' Association of Los Angeles has set Tuesday evening, Feb. 17, as the date of its third annual electrical ball, which will be held at the Goldberg-Bosley School for Dancing, Sixteenth and Flower Streets.

Los Angeles Electric Club Holds Annual Election

At the recent annual election of the Los Angeles Electric Club the following officers were elected for the ensuing year:

President—J. E. MacDonald, Joint Pole Committee; first vice-president—B. G. Wright, Southern California Telephone Company; second vice-president—B. F. Pearson, Southern California Edison Company; third vice-president—S. E. Gates, General Electric Company; secretary-treasurer — R. J. McHugh, Garnett-Young Company; sergeant-at-arms—R. H. Manahan, city electrician; J. G. Loomer, Western Electric Company.

The following were made directors: F. E. Seaver, Los Angeles Gas & Electric Corporation; W. L. Frost, Southern California Edison Company; G. E. Arbogast, Newbery Electric Corporation; K. E. Van Kuran, Westinghouse Electric & Manufacturing Company; H. L. Harper, Western Electric Company; H. E. Sherman, Jr., Illinois Electric Company; L. E. Moselle, Los Angeles Bureau of Power & Light.

COMING PACIFIC COAST ELECTRICAL ASSOCIATION MEETINGS

Executive Committee—
Rialto Building, San Francisco, Calif.
Feb. 19, 1925

Technical Section—
Conclave and Executive Meeting—San Joaquin Light & Power Building, Fresno, Calif.
March 25-27, 1925

Commercial Section—
Conclave and Executive Meeting—San Joaquin Light & Power Building, Fresno, Calif.
April 3-4, 1925

Pacific Coast Electrical Association—
Annual Meeting—San Francisco, Calif.
June 15, 1925

Idaho Chapter of A.A.E. Holds Meeting at Twin Falls

The Idaho chapter of the American Association of Engineers held its annual meeting at Twin Falls, Idaho, Jan. 15 and 16. The program included the annual address by J. P. Congdon, the outgoing president; an address by J. A. Harader, secretary of the Idaho Chamber of Commerce, of Pocatello; an address by W. H. Gibson, of Boise, member of the Idaho public utilities commission; an address by L. R. Cook, of Nampa, Idaho, on "The City-Manager Plan and its Application to Idaho;" an address by G. C. Baldwin, United States Geological Survey engineer, on "Snake River Water Distribution;" an address by Dana Templin, of the United States Bureau of Reclamation, on "Construction of the American Falls Dam and the Effect of Additional Stored Water in the Snake River Valley." Dean I. C. Crawford, of the University of Idaho, also spoke on the water resources of the State of Idaho.

Declaring a period of prosperity is spreading over the country and that the slump is past in the State of Idaho, Mr. Congdon in his address stressed the need for optimism and the need to look to the future with confidence. The railroads, said Mr. Congdon, will spend approximately a billion dollars a year for the next ten years, while the electrical companies will be forced to spend approximately $600,000,000 a year for the next few years to meet improvements long needed.

Personals

John C. Campbell, for thirteen years associated with the Pacific Power & Light Company, Portland, Ore., resigned Feb. 1, 1925, to accept a position with the securities department of the Electric Bond & Share Company, New York City. In his new position he will have headquarters with the Memphis Power & Light Company, Memphis, Tenn., a subsidiary of the Electric Bond & Share Company. Mr. Campbell was born in Kansas City, Mo., in 1881. At the age of nineteen, after having graduated from the public schools and completed a course in a business college in that city, he went to work for the Pacific Express Company and remained in that and other employment in his home city for four years. In 1904 he removed to Portland, Ore., where he spent four years as assistant cashier of the Southern Pacific Company, and three years with Tull & Gibbs Furniture Company. Seven years later he entered the employ of the Pacific Power & Light Company. Here he directed the statistical department until May, 1918, when he was promoted to the position of traveling auditor with headquarters at Yakima, Wash., retaining that post until the present time.

JOHN C. CAMPBELL

R. L. Stewart, local manager at Cottage Grove, Ore., for the Mountain States Power Company, Albany, has been elected president of the Cottage Grove Commercial Club for 1925.

R. M. Bleak, superintendent of lighting and appliance sales, Utah Power & Light Company, Salt Lake City, Utah, was re-elected secretary-treasurer of the Rocky Mountain Electrical Cooperative League at the last election. Mr. Bleak has held that office in the league since its organization in 1920.

W. E. Creed, president, Pacific Gas and Electric Company, and president, Columbia Steel Corporation, San Francisco, was the principal speaker at the seventh annual dinner conference of the Utah Associated Industries held recently in Salt Lake City. His subject was "The Fruits of Collective Thinking."

Clarke F. Edwards, who has returned to Los Angeles after a six months' sojourn in the East, has been appointed representative of the Majestic Electric Appliance Company for southern California, with headquarters in Los Angeles. Prior to his departure for the East, Mr. Edwards was manufacturers' agent, representing several glass and other fixture manufacturers.

R. Wolfsberg, formerly manager of the Los Angeles branch of the Allied Industries, Inc., has recently severed his connection with that organization and is now a manufacturers' representative with offices in Los Angeles and San Francisco.

J. O. Case, assistant manager of the Los Angeles office, General Electric Company, recently spent several days in Phoenix and other Arizona points with the representatives of that company in the Arizona territory.

G. E. Emmons, retired vice-president of the General Electric Company, has recently moved to Pasadena, where he plans to make his future home. Mr. Emmons was formerly vice-president in charge of manufacturing at the Schenectady Works.

Frank J. Gleiss, formerly Pacific Coast representative of the Line Material Company, South Milwaukee, Wis., has been appointed district manager for the company in this territory and will have full charge of the firm's branches in Los Angeles and Oakland, Calif., and Portland, Ore. Mr. Gleiss recently returned from South Milwaukee, where he attended a sales convention.

P. B. Garrett, general engineer for the San Francisco office of the Westinghouse Electric & Manufacturing Company, recently returned to that city after an extended trip throughout the company's entire Western territory. In Salt Lake City, Boise, Denver and Pueblo Mr. Garrett spoke on supervisory control and also on the klydonograph, the latest form of wave meter.

G. C. Ward, vice-president in charge of operation and construction, Southern California Edison Company, Los Angeles, was a recent visitor to San Francisco.

T. D. McMullin, of the Atlantic Pacific Agencies Corporation, San Francisco, recently left for the East to visit various factories which his firm represents on the Pacific Coast.

R. E. Smith, advertising manager, Southern California Edison Company, Los Angeles, recently made a short business trip to San Francisco. While there he attended the weekly luncheon meeting of the San Francisco Electrical Development League.

R. M. Davis, statistical editor of Electrical World, New York, addressed a joint meeting of the Denver section, A.I.E.E., and the Electrical Cooperative League in that city during his recent tour of the West. He also gave an illustrated talk before the members' council of the Denver Chamber of Commerce.

Alvin J. Fisher, vice-president in charge of manufacturing, Hurley Machine Company, Chicago, has been on the Pacific Coast recently conducting a series of talks to salesmen with relation to the small household ironer which his company is putting on the market.

M. P. Rice, manager, publicity department, General Electric Company, Schenectady, N. Y., spent some time in San Francisco a short while ago.

F. S. Mills, who has been Pacific Coast representative of Curtis Lighting, Inc., Chicago, Ill., has been made vice-president and general manager of the newly organized Curtis Lighting, Inc., of California.

S. Smith Stevens, son of the late Stanley S. Stevens, who, upon the recent death of his father became manager of the Stevens Sales Company of Salt Lake City, Utah, has left for France to be gone about three years. Thad Stevens, formerly with the Inter-Mountain Electric Company, a brother of Stanley S. Stevens, has assumed active management of the Stevens Sales Company. This firm deals in Bryan-Marsh lamps and Byron-Jackson pumps.

Carl F. Wolf of the Valley Electrical Supply Company, Fresno, Calif., was a recent Los Angeles visitor.

George T. Hibbert, Jr., extension clerk in the Astoria, Ore., district organization of the Pacific Power & Light Company, Portland, Ore., has been promoted to be district manager at Toppenish, Wash. He succeeds **Glen L. Corey**, who has been transferred to The Dalles, Ore.

John L. Busey, formerly manager, Butte Electric Supply Company, Butte, Mont., is now affiliated with the Pacific States Electric Company, with headquarters in San Francisco.

Arthur Isbell, Radio Corporation of America, San Francisco, was a guest at a recent luncheon meeting of the San Francisco Electrical Development League.

C. B. Kenney, vice-president of the Ne Page-McKenny Company, and manager of the San Francisco branch, has been elected president of the San Francisco Electrical Devolpment League. "Cap" Kenney, as he is known to the electrical fraternity, has been engaged in the electrical industry for over twenty years, having started in 1903 as a wireman in the employ of David Cronin, one of the first electrical contractors in the State of New York. Four years later he came to California and some time after he went to Seattle. At the time of the organization of the Ne Page-McKenny Company in that city in 1911 he joined the firm, and in 1914 removed to San Francisco where he opened for the company the office of which he has ever since been manager. Mr. Kenney was born in the State of New York and educated at Syracuse University.

C. B. KENNEY

C. P. Wallis, formerly with the Torrington Company, Torrington, Conn., has joined the sales force of the National Lamp Works of the General Electric Company, Oakland, Calif.

E. E. Walker, sales engineer, British Columbia Electric Railway Company, Ltd., was a recent visitor in San Francisco.

Lawrence W. Davis, general manager, Association of Electragists, International, with headquarters in New York, was the guest of honor at a luncheon tendered him by San Francisco members of the California Electragists in that city Feb. 9.

C. J. Hancock, manager for the Public Service Company of Colorado in the Clear Creek region, has been elected vice-president of the Bureau of Mines ando Commerce in Idaho Springs, Colo.

V. L. Board, general superintendent, Public Service Company of Colorado, Denver, has been elected a member of the board of directors of that company. He was also recently re-elected secretary-treasurer of the Rocky Mountain Committee on Public Utility Information. He was largely instrumental in organizing the committee and has held the office of secretary-treasurer since that body was formed. Mr. Board entered the utility field immediately upon his graduation from the University of Missouri in 1910, joining the organization of the Denver Gas & Electric Light Company as junior engineer. After remaining in Denver two years, he was transferred to the office of the Doherty interests in New York, where he was engaged in engineering and rate work. In 1917 he returned to Denver on an assignment covering special work for the gas and electric company, and five years later was appointed assistant general manager, a newly created position. About six months later he was named general superintendent, retaining that title when the Denver Gas & Electric Light Company was merged with the Western Light & Power Company of Boulder to form the Public Service Company of Colorado. In addition to his work in the electrical industry, Mr. Board is active in the civic affairs of Denver and has served as a member of the industrial development board of the Denver Civic and Commercial Association. He is a member of the American Institute of Electrical Engineers and of Sigma Xi and Tau Beta Pi, honorary engineering fraternities.

V. L. BOARD.

J. M. Curtin, manager industrial department, Westinghouse Electric & Manufacturing Company, East Pittsburg, Pa., arrived recently in Seattle for a conference with local representatives of the company.

Wm. F. Raber, general manager, **L. M. Klauber**, general superintendent, and **A. E. Holloway**, superintendent of the commercial department of the San Diego Consolidated Gas & Electric Company, the latter acting also for the San Diego Chamber of Commerce as its president, welcomed the representatives of the American Gas Association upon their visit to San Diego, Feb. 3, following the convention with the Pacific Coast association in Los Angeles.

W. C. Sterne, general manager of the Arapahoe Power & Light Company and other affiliated companies with headquarters in Denver, was re-elected chairman of the electrical bureau of the Denver Chamber of Commerce at the recent annual meeting of that body. **S. W. Bishop**, manager of the Electrical Cooperative League, was named vice-chairman for the second time, and **George E. Lewis**, manager of the Rocky Mountain Utility Information Committee, was again chosen as secretary and treasurer.

Franklin T. Griffith, president of the Portland Electric Power Company, and also president of the National Electric Light Association, and **Guy W. Talbot**, president of the Pacific Power & Light Company, both of Portland, recently traveled together to Chicago to attend a meeting of the public policy committee of the National Public Relations Section of the N.E.L.A.

W. Wesley Hicks, electric air-heater manufacturer of San Francisco, has announced the issuance of U. S. patent No. 1,518,067, which broadly covers the basic invention made by him.

E. P. Lovejoy, Jr., of the News Bureau of the General Electric Company, has been transferred from Schenectady to New York City, to represent the publicity department at the executive offices of the company.

Harry S. Delancie, for the past fifteen years associated with the San Francisco office of the Westinghouse Electric & Manufacturing Company in the industrial sales department, has joined the staff of Maydwell & Hartzell, Inc., of that city, as sales engineer.

Martin E. Fibush, San Francisco manager for the Connecticut Electric Manufacturing Company, Bridgeport, Conn., recently returned from an extended visit at the factory where he attended the annual sales conference.

Clare N. Stannard, vice-president and general manager, **G. W. Faller**, assistant vice-president, and **John E. Loiseau**, secretary, respectively, of the Public Service Company of Colorado, have returned to Denver from an extended conference with officials of the Doherty company in New York.

E. A. Phinney, of the Jefferson County (Colo.) Power & Light Company, and **George E. Lewis**, manager of the Rocky Mountain Committee on Public Utility Information, attended the meeting of the N.E.L.A. Public Relations Section in Chicago recently as representatives of the Rocky Mountain division.

Curtis B. Hawley, vice-president and general manager, the Inter-Mountain Electric Company, Salt Lake City, and president of the Rocky Mountain Electrical Cooperative League, spent some time in San Francisco lately.

Herbert Rose, Federal Electric Company representative in southern California, was elected president of the San Diego Electric Club at its annual meeting recently. Mr. Rose was graduated from the Armour Institute, Chicago, in 1909, with the degree of bachelor of science and electrical engineer. For some years after leaving college he was active in general engineering and construction work, principally with Swift & Company of Chicago, with whose organization he was associated for eight years as construction engineer. During the World War he was made manager of a plant established by the government in the Ozark Mountains in Missouri to furnish chemicals necessary for the fireproof coating of army airplanes.

HERBERT ROSE

Shortly after the close of the war he came to California and entered upon his duties with the Federal Electric Company. Mr. Rose has been associated with many local projects in San Diego, and has been particularly active in the Electric Club. He served as vice-president of that organization during 1924, and made a most successful chairman of the program committee during the preceding year.

Harry J. Martin, president of the Seattle Electric Club, recently paid a visit to San Francisco.

Obituary

John R. Dee, consulting engineer, The Pacific Telephone & Telegraph Company, Seattle, Wash., fell to his death from a third-story window in his apartments recently, following a fainting spell. Mr. Dee was a member of the American Association of Engineers.

Alphonse Forsman, engineer and electrician at the Olympia Veneer Company's plant, Olympia, Wash., was electrocuted recently when he threw a switch in the floating dragsaw plant in the mill pond, dying twenty minutes later. He is said to have been standing in a few inches of water.

Lynn B. Easton, manager of the Laidlaw Works of the Worthington Pump & Machinery Corporation, New York, died at Cincinnati, Ohio, Jan. 24, 1925.

TRADE NOTES

The Liberty Gauge & Instrument Company, Cleveland, Ohio, has announced its removal to 6612 Euclid Avenue, that city, where the capacity will be twice that of its former quarters.

The Electric Service Supplies Company, Philadelphia, Pa., has announced that it has assumed the exclusive sale and distribution of the entire output of the Franklin Porcelain Company, Morristown, Pa., manufacturers of high-voltage porcelain insulators and fittings. Western representatives of the firm are: F. H. Bodler, San Francisco, Calif., A. W. Arlin, Los Angeles, Calif., and Franklin Sales Company, Denver, Colo.

E. H. Freeman Electric Company and **Trenton Porcelain Company**, both of Trenton, N. J., have announced their consolidation under the name of Circle F Manufacturing Company. No change in management, organization or business policy is contemplated.

The Sangamo Electric Company, Springfield, Ill., has opened a direct sales office at 19 Pearl Street, Boston, Mass., where a complete stock of meters and accessories has been placed to render adequate service in the New England territory.

The General Electric Company, Schenectady, N. Y., has issued Bulletin No. 48941A, entitled "CR-9006 Enameled Resistor Units." This is a well illustrated booklet describing the uses and advantages of these units and giving standard ratings and dimensions. Applications are given for several different fields of service. The bulletin contains eighteen reading pages.

The R. Thomas & Sons Company, East Liverpool, Ohio, recently issued an attractive four-page booklet to commemorate the close of its fiftieth year in business. Illustrations of events in the early stages of electrical development make the pamphlet particularly interesting.

The F. W. Wakefield Brass Company, Vermilion, Ohio, has recently developed "Red Spot" kitchen unit No. 1171-PI, which it is claimed embodies a sturdy and approved method of attaching convenience outlet at very low cost and with the minimum expense for installing. A metal channel is screw-bolted to the porcelain enameled steel canopy, which in turn is rigidly clamped to a heavy steel strap. The outer extremity of this channel is screwed to the ceiling, giving solid support to the three-conductor drop cord which terminates in a plug-in switch. The unit is shipped complete except glassware.

The George W. Dunham Corporation, Utica, N. Y., has been incorporated recently to manufacture electrical labor-saving appliances. It will market as its initial product an electric centrifugal washer and dryer. It is planned to add shortly other lines, each to fill a certain place in the growing demand for labor-saving equipment.

A. Schleuter & Company, Oakland, Calif., is now featuring Johnson Impeller washers, which are made in that city.

The Rome Wire Company, Rome, N. Y., has announced that it has been granted patent No. 1,520,680, covering its new non-metallic armored cable "RomeX".

Western Electro-Mechanical Company, Oakland, Calif., has prepared a pamphlet, "Automatic Substation Equipment," covering its Type S2 and Type S3 reclosing mechanism and Type SS relay. It is well illustrated with cuts and charts.

The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has recently applied the sheet-metal case construction to its distribution transformers of 6,900, 11,500 and 13,800-volt rating. Hitherto, the sheet-metal construction of transformer cases was limited to distribution transformers for 2,300-volt service. The substitution of the sheet-metal parts for the cumbersome cast-iron parts formerly used effects a great reduction in weight and physical dimensions, and at the same time increases the strength and ruggedness of the transformer.

The Manchester-Moneta Electric Company is the name of a new electrical store opened a short time ago at 305 West Manchester Street, Los Angeles, by J. S. Richards and R. E. Gansert. In addition to contracting, the firm will stock a complete line of fixtures and appliances.

J. T. Fagan has recently developed a carrier for spare Mazda automobile lamps designed to permit the autoist to carry extra lamps in a convenient and safe manner. The holder is attached to the instrument board of the car and swings up under the board so that it is out of sight. Lamps are placed in blind sockets in the carrier and are subjected to no undue vibration. When a lamp is needed the carrier is pulled down, the lamp detached and the carrier is pushed back again out of the way. Two types of carriers are offered, one with a capacity of four lamps and the other with space for seven. The carriers are made of metal, finished in black, and each socket is designed for a particular type of spare lamp. The devices are being distributed by Asch & Company, 23 West 60th Street, New York.

U. S. Electrical Manufacturing Company, whose executive offices and works are at 200 E. Slauson Avenue, Los Angeles, and branch office and warehouse at 583 Howard Street, San Francisco, has published the initial number of "U. S. Motor News," a monthly good-will booklet of four large pages designed, according to its foreword, to pass on a reflection of the spirit of the organization, to introduce to one another its friends in its wide territory, and to present information about Western industries and their relations with the East as well as the West. The sheet is well printed and illustrated.

The Ambassador Electric Company, 2717 West Seventh Street, Los Angeles, has been recently established by F. R. Stone, formerly manager of the Eagle Electric Company of that city. The concern will merchandise radio and electric appliances.

Even Los Angeles comes to Del Monte to learn from San Francisco how to take movies, admit Harry Harper, district manager, Western Electric Company; "Shorty" Sherman, sales manager, Illinois Electric Company; "Newt" Graham, Graham-Reynolds Electric Company, and "Charlie" Listenwalter, Listenwalter & Gough, all of Los Angeles, who are receiving instruction from "Sandy" Sanderson, Pacific Coast manager, Bryant Electric Company, and Roscoe Oakes, manager National Carbon Company, both of San Francisco.

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Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES

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All Eyes Will Be on the West

THIS year San Francisco is fortunate in having been selected as the place where the annual convention of the National Electric Light Association will be held. This is the outstanding event of the year within the electrical industry, and from now on until after the convention is held, all eyes will be focused upon the city by the Golden Gate.

The Western states have made many contributions to the electrical industry. In California, the impulse turbine, better known as the Pelton wheel, was developed. The West is the birthplace of long-distance, high-voltage transmission; more than 70 per cent wired homes; and the customer-ownership idea.

The farm in the Western rural districts is just as familiar with the electrical servant as the city. The smoky oil lamp has no place in the West. Thus, in keeping with the spirit of Western progress, the Journal of Electricity is planning a special service commemorative of this event in keeping with its importance.

On June 1 will be published the papers covering a year of research on the part of the committees of the Pacific Coast Electrical Association. Since the only meeting of this association will be a brief session for the transaction of business, the importance of this publication is emphasized. On June 15 will be published the special convention issue typifying electrical progress in the West.

Advertisers well may take advantage of this unusual set of conditions and the opportunity offered by the selling section of the Journal.

EDITORIAL

Complete Electrification Should Begin at Home

THE members of the electrical industry have been rather active in endeavoring to sell the public on the idea of complete electrification and have met with considerable success. But how many of these salesmen, contractors, and others who are trying to sell the idea have their own homes completely electrified? Can they hope to meet with anything but mediocre success until they practice what they preach?

On another page of this issue is a description of the home of an electrical contractor who has seen the way and has constructed for himself a complete electrical home. He has lived in it during the coldest months of the year and has found from his own experience that it is economically practical, which overcomes the largest obstacle in the way of the greater application of electricity. The other benefits and comforts have also been more thoroughly realized.

What better sales argument can anyone have than the fact that he has his own home completely electrified? If the electrical industry wants the public to become sold to the idea, it must first begin at home.

A Monument to Private Enterprise and Initiative

FLORENCE Lake tunnel, one of the greatest engineering and construction achievements of the decade, has been holed through by the Southern California Edison Company. Driven thirteen and a half miles through solid granite, the tunnel connects Florence Lake on the headwaters of the San Joaquin River with Huntington Lake, the storage reservoir for the chain of Big Creek plants. Located high in the Sierra Nevadas, the tunnel involved almost insurmountable difficulties, especially in the transportation of construction materials and supplies.

The tunnel is the longest for its bore—15 ft.—in the world. It was constructed at a cost of $17,000,000, or more than the entire cost of the original Big Creek installation, including power houses No. 1 and No. 2, the 240-mile transmission line to Los Angeles, and the Eagle Rock substation.

The fact that the tunnel was constructed in twenty-two months less time than originally estimated is in itself a remarkable achievement. It is indicative of the contribution the Edison company has made to the art of tunnel construction. Refinements in machinery and practice which made this record possible were developed and perfected and have been made available for tunnel engineers and constructors throughout the world.

The greatest significance of the tunnel, however, is entirely economic. Its construction by any agency other than the Edison company, or a similar large utility would have been impossible. Its cost would have been prohibitive. However, tying in, as it does, with a large system of hydroelectric plants, where the water will be used over and over again in a chain of generating stations, it becomes economically feasible. Thus it demonstrates the necessity for large and diversified electric service companies as against small municipally owned systems. As hydroelectric developments become more complicated and difficult, as they will in the future, it will be the private companies who develop them and make their benefits available for the consuming public.

Florence Lake tunnel is not only a fitting monument to the initiative and genius of the men who conceived, financed and constructed it, but to private initiative and enterprise as well.

Jack and the Wrong Beanstalk

THAT most of us have never outgrown our love of fairy tales is evidenced by the avidity with which we devour most of the material of fairy-tale variety that appears in our favorite newspaper. Almost daily there are crowded upon our consciousness stories of giants, ogres and goblins, at first believed to be real, and relegated to the limbo of broken idols, where reside so many of the illusions of childhood, only after the light of truth and education has been thrown upon them.

The quantity of material about the so-called "Power Trust" that recently has been circulated in the daily press must have conjured up in the minds of many lay readers a picture of some powerful and grasping giant. Surely the image is no longer that of an octopus, since all the cross-word puzzlers now know that most species of that well-known cephalopod are small and usually timid and inoffensive. In any event the image is evil, and it is safe to assume that part of the agitation against privately owned power companies in the West, taking the form of inimical legislation proposed from year to year in the three Coast states, has developed through fear of the existence of a supposed trust. The imaginative ones perhaps picture the giant reposing near the top of a beanstalk, while the part of the diminutive "Jack" with his axe is played by the Sen-

ator Norris resolution directing the Federal Trade Commission to investigate the General Electric Company.

Odious as is the thought of the impending investigation to members of the electrical industry, they should make the best of it. The company itself has welcomed the inquiry, which, it says, "is better than unfounded charges based on misinformation." If talk of a "Power Trust" has been damaging to the industry, and it undoubtedly has, then let the light of truth stop this talk by proving that there is no trust. Let us welcome anything that may tend to kick the props out from under one of the principal arguments of the government-ownership proponents. Let us watch Jack cut down the wrong beanstalk.

Keeping in Close Touch with the Consumer

THE question of reaching the consumer with pertinent messages other than through the advertising pages of the newspapers has become a problem with the electric service company. In the development of a customer-relations and public-relations program the companies are coming to the conclusion that a regular organ addressed specifically to the consumer, carrying not only news of the company but a definite sales message, is almost a necessity. The experience which various central stations have had with organs of this kind addressed to stockholders has served them in good stead.

The latest company to address a booklet specifically to its consumers is the British Columbia Electric Railway, Ltd. "Utility Topics—A Magazine of Service" is the title of its consumer organ. In the initial issue the following statement is made:

"Though ours is a public utility business, yet it confers benefits on the users in the form of convenience, labor-saving and economy. It is therefore our responsibility to promote the use of electricity and gas, not for any monetary return it would mean to this company, but rather so that a full measure of the blessings of these services would be available to the public."

That briefly explains one of the reasons for booklets of this character. As the industry progresses and as electric service companies realize the growing importance of customer relations, we look for a greater use of bookets such as this.

Not "Beware of the Dog" But "Visitors Welcome"

IN the memory of almost every individual is a picture of some house of his childhood which was forbidden ground. It was the abode as a rule of some old codger who had forgotten what it is to be young, and usually it was decorated with a sign which read, "Beware of the Dog." The power houses and substations of Western power companies in most cases do not bear any such forbidding aspect. They are well designed and attractive buildings, kept up in good condition and surrounded by a bit of parking or flowers. But they do carry the sign "No Admittance." It is undoubtedly a little thing and probably produces no conscious reaction in the minds of those who pass by; they do not particularly wish to enter the precincts.

Is there not a subconscious relation, however, between such a sign and the "Beware the Dog" memory of childhood? The power company's property and, in consequence, the power company, take their places among the great group of selfish interests concerned with other business than that of the individual—not interested, obviously, in him or in his welfare. There is perhaps some association of the warning with the idea that electricity is dangerous.

Very different is the effect of the sign recently erected by one California power company on all operating properties. It reads "Visitors Welcome—apply to (whomever is the appropriate person in that case) for permission to enter." Perhaps no one may actually take advantage of this sign, but, on the other hand, there is a real interest on the part of the public in the operation "back of the button" and they might welcome an opportunity to inspect the premises. In any case it is a symbol of friendliness and hospitality. It is a real contribution toward the attainment of pleasant public relations.

Court Decision Affects Future Water-Storage Projects in California

AS the result of a new interpretation of the California water right law, future storage of the waters of the streams of that state for power generation, water supply and irrigation will be impossible without first condemning the rights of lowland riparian owners on the grounds of public convenience and necessity. Unless higher courts reverse the decision in the widely discussed Herminghaus case—reported on another page of this issue—future storage projects are jeopardized and much costly litigation will be necessary.

In the case in question, suit was brought against the Southern California Edison Company to restrain it from storing the waters of the San Joaquin River on the grounds that the storage of water interfered with the normal flow of the river and prevented the spring floods from overflowing certain grazing lands, thereby providing natural irrigation and replenishing the ground water supply.

Several fundamental questions in water-right law were involved. The court held that while the power company as a lessee of the federal government was entitled to certain riparian rights which would nominally accrue to the government, the storage of water for power-generation purposes was not a right incident to riparian ownership. Should this decision be upheld in the higher courts, permits from the Federal Power Commission would be limited to the extent that the rights granted by these permits are subordinate to the vested interests of riparian owners lower down on the stream to which the permits apply.

The storage of water for power generation affords benefits to the public which apparently have been overlooked by the court. Flood control, the regulation of stream flow for the service of valley irrigationists during the dry season, the utilization of natural resources, otherwise wasted, for the generation of hydroelectric power are benefits that greatly

overshadow the alleged rights of the property owners who brought the suit. In the opinion of attorneys interested in the case—an opinion in which we heartily concur—public interests in this case have been subordinated unreasonably to supposed private interests in an effort to live up to the letter of the law.

California Cooperative Campaign Now California Electrical Bureau

A hearty welcome to the California Electrical Bureau, a worthy offspring of our old friend, the California Cooperative Campaign. The word, "campaign," was a misnomer, in that the idea conveyed was that of an effort in behalf of a single movement that would cease when that objective had been reached.

The Campaign, or rather, the "Bureau," has become an institution. It is typically Californian in its organization, its concepts and its ideals, and it might be added, in the originality of its methods of accomplishing the purposes for which it is organized.

Elsewhere, sales promotion work of a cooperative nature is undertaken by electrical leagues and clubs that function locally and without any special attempts to co-ordinate their efforts on a state-wide basis. California, as usual, is different. Its leagues and clubs are predicated upon their value as social rather than business factors, leaving cooperative sales promotion efforts to the "Bureau" on a statewide basis. Thus a co-ordinated effort is assured, duplication is avoided, and research and investigation are undertaken in behalf of the state as a whole.

The Bureau is also to extend its organization to include all factors engaged in merchandising electrical products, a judicious and well thought out improvement over the old Campaign. When carried forward to the ultimate, the Bureau will present a cross-section of the commercial electrical industry in California as it pertains to the general problems of marketing, a dream for years of the best thinkers in the industry, now happily about to be brought to fruition.

To R. E. Fisher and the members of the advisory board whose hard work has made this possible we extend our hearty congratulations.

Test Dam Will Reveal Much Needed Information

ACCURATE design data on arch dams will soon be made available for the engineer. Such has been the progress of Engineering Foundation's arch dam committee that at the present time a fund in excess of $60,000 has been subscribed for the construction of a test dam. As reported on another page of this issue, a tentative site has been chosen on Stevenson Creek in Fresno County, Calif., and actual construction will be started as soon as certain details have been worked out.

Heretofore there has been a paucity of design data for such structures. Because of this lack of information there has been a tendency to use more materials and to make dams more massive than necessary, thus greatly increasing the cost. Although arch dams have been used for centuries their design is still a matter of theory and conjecture, even though there has not been a single recorded failure of a concrete or other masonry arch dam. There are no accurate data regarding the factor of safety in such structures, and much lower unit stresses have been adopted for dams than for other types of concrete construction chiefly because simple laboratory experiments to determine the unit stress on dams have been out of the question.

With the test data to be made available as a result of the experiments in California and with the research material which is being collected by the arch dam committee, it will be possible to design structures in the future more economically than in the past and at the same time provide an ample safety factor. This will undoubtedly have a beneficial effect upon the public at large, for it may make possible the construction by irrigation districts, water supply districts and power companies projects which, at the present time, are considered infeasible because the cost of an impounding dam is prohibitive.

A Job So Big That Its Significance Is Lost

ANNUAL expenditures for improvements and extensions of power systems in the West have reached nine figures. In fact, the sums appropriated for this purpose have become so great that the mind can hardly grasp their significance. Not many of us can think in terms of hundreds of millions, so variations of a few odds and ends of digits are passed over lightly as something beyond the ken of the so-called "average" man.

It remains to reduce such forms of expression to a unit basis. Then, and then only, does the average mind begin to realize what is actually happening to power development in the eleven Western states. Reduced to a per-capita basis, expenditures of money for improvements and extensions to power systems in this territory during 1924 were $19; this is the amount invested for every man, woman and child of population. The program for 1925 calls for $20 per capita, an increase of about 5 per cent.

In the light of these figures it is not surprising that the rest of the world must turn to the West to study the effects of interconnection, high-voltage transmission, the electrification of the home, the farm, and industry; and customer-ownership, to say nothing of the results achieved by the development of these great projects under private initiative with commission regulation.

It is significant that in this territory rates are lower than anywhere else in the United States, and this without any Niagara Falls as a source of power situated close to population centers. Long-distance transmission for hundreds of miles between the mountains and the markets for power is characteristic of Western conditions.

Truly, we who live so close to the results of our own efforts hardly realize how good a job we are doing, until we travel about and learn at first hand of the conditions that prevail elsewhere. Let the good work go on.

THE Huntington Lake portal of the Florence Lake tunnel constructed by the Southern California Edison Company under the Kaiser Range of the Sierra Nevadas in Fresno County, Calif. This tunnel, 13½ miles in length, was driven through solid granite and is one of the greatest engineering achievements of the decade. Grouped around the progress chart are company engineers and officials responsible for the construction record.

Construction of 13-Mile Florence Lake Tunnel Sets Many Records

WITH the completion of the Florence Lake tunnel, which joins the head waters of the South Fork of the San Joaquin River with Huntington Lake and was built in connection with the Big Creek development in the Sierra Nevada Mountains, the Southern California Edison Company has accomplished one of the greatest engineering undertakings of the century. Costing in excess of $17,000,000, the tunnel represents a greater investment than the original installation at Big Creek, comprising No. 1 and No. 2 plants, the 150-kv. transmission line to Los Angeles, and Eagle Rock substation. The tunnel was conceived by George Clinton Ward, vice-president in charge of construction and operation of the Southern California Edison Company, and was constructed under his general supervision.

GEORGE CLINTON WARD

Vice-president in charge of construction and operation of the Southern California Edison Company, who conceived and supervised the construction of the world's largest hydroelectric power tunnel through the Kaiser range of the Sierra Nevada Mountains.

The final blast was fired Feb. 18, 1925. Previous to this, two other headings had been holed through, the first between Camps 61 and 62 on Oct. 29, 1924, and the second between Camps 60 and 61 on Feb. 11, 1925. The tunnel was completed more than a year earlier than was originally estimated. At the present time work of moving construction equipment from the two adit camps and the Florence Lake portal through the tunnel is under way. It is planned to have the tunnel in service to catch the 1925 run-off.

Records in Tunnel Construction

This tunnel, which has the greatest diameter of any tunnel of its length in the world, is constructed through solid granite. It follows the north contour of the Kaiser range, which lies in the northeastern part of Fresno County, Calif., at an altitude of about 7,200 ft. Through the tunnel the upper waters of the San Joaquin River will be diverted, under the mountains, down through Huntington Lake, and through the generating stations along Big Creek and the lower San Joaquin River canyon for some twenty miles. The tunnel is 67,640 ft. long, more than twice as long as the Rogers Pass tunnel on the Canadian Pacific Railway, which previously was the longest of its bore in America; and about 2,000 ft. longer than the Simplon tunnel through the Alps in Switzerland, which up to this time was the longest tunnel of its size in the world. Some remarkable records have been made on this tunnel by the use of modern equipment, high explosives and efficient organization. The maximum monthly progress per heading was 692 ft., which was an average of over 22 ft. per day. During one week a progress of 174 ft. was made at one heading, an average of 24.9 ft. per day or over one foot per hour, through solid granite. On several different days an advance of 30 ft. was made at a single heading.

Active construction work was started in the summer of 1920. Camp 60 was constructed at the outlet of the tunnel at the eastern end of Huntington Lake, and a road was started over Kaiser Pass to the site of the adit at Camp 61 in order that work could be started at the Camp 61 end of the long section through the ridge before winter set in.

Excavation at the outlet portal was under cover on Oct. 15, 1920, and the adit portal at Camp 61 was under cover on Dec. 11, 1920. At both of these headings bad ground (sand, boulders, decomposed granite and some quicksand) was encountered for approximately 1,000 ft. This made the excavation slow and very difficult and required heavy timbering. At Camp 61, where the overhead cover was light, two shafts were sunk in good rock further ahead on the tunnel so that work could proceed at a good rate even though the bad section at the portal was still uncompleted.

During the summer of 1922 the construction road was extended to the intake end of the tunnel at Florence Lake, and before winter set in Camps 62 and 63 were completed and stocked with materials to start work on the next longest section of the

tunnel between the intake and Camp 62. Excavation at the Camp 62 adit was under cover on Aug. 11, 1922, and at the intake portal on Dec. 25, 1922.

Excavation on the short section between Camps 61 and 62 was started in June, 1923. Considerable extra time was allowed for the excavation of this section, as bad ground was anticipated from surface indications. However, very little bad ground was encountered, and the section was completed Oct. 29, 1924—considerably ahead of schedule.

Construction on all sections of the tunnel was programmed so that they should hole through together. This was to avoid spending any money sooner than necessary, thereby keeping interest on the investment down to a minimum. The 6¾-mile section between Camps 60 and 61 holed through on Feb. 11, 1925 and the remaining section between Camps 62 and 63 on Feb. 18, which is meeting out almost exactly according to plan.

The crew of men employed on the construction of the tunnel varied from a minimum of 500 in 1920 to a maximum of 2,000 in 1924, when all six headings were working. All told, 1,773,000 man-days were required in the construction of the tunnel.

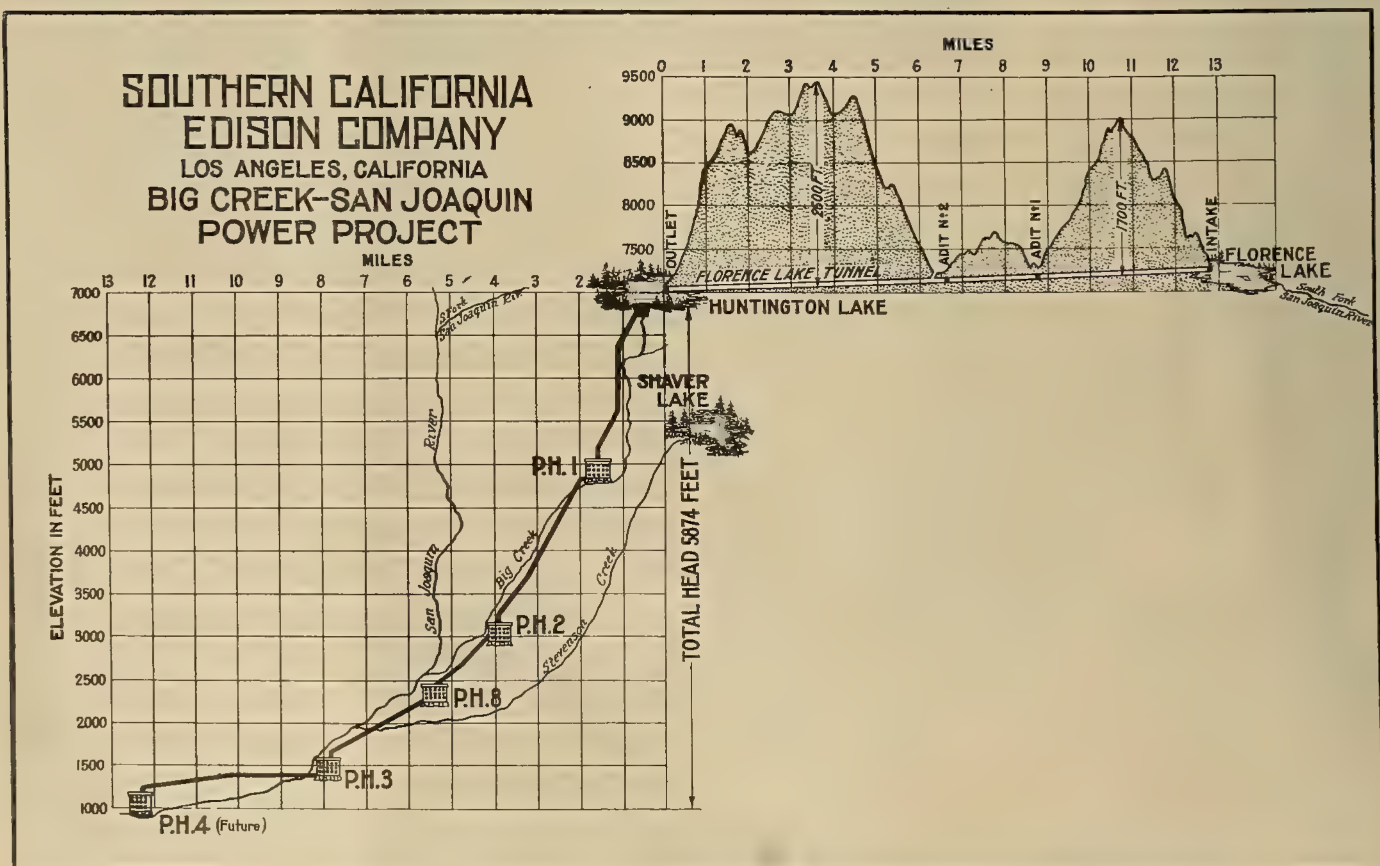
Transportation Difficulties Overcome

On acount of the severe winter weather and deep snows at El. 7,000 and above, it was necessary to haul all food and construction supplies to the tunnel camps during the summer months as the road was impassable for heavy trucking during the winter. This made necessary the provision of complete refrigerator plants at each camp to protect the perishable supplies, and large warehouses to store the other supplies. The following table will give some idea of the quantities of some of the major construction items which were necessary in the excavation of the tunnel:

Blasting powder	5,200,000 lb.
Blacksmith coal	2,100,000 lb.
Blacksmith coke	2,720,000 lb.
Drill steel	1,150,000 lb.
Muck cars, flat cars & concrete cars	390 cars
Railroad track	22 miles
24-in. blower pipe	70,000 lin. ft.
Electric locomotives	38
6-in. air and water pipe	73,000 lin. ft.
4-in. air and water pipe	83,000 lin. ft.
2-in. water pipe	80,000 lin. ft.
Cement for concrete lining	140,000 sacks
Estimated total tonnage of supplies hauled from Cascada for the construction of the tunnel	60,000 tons

The principal means of transportation during the period in which fifteen to thirty feet of snow was on the ground consisted of snow boats or sleds drawn by horses or caterpillar tractors and in stormy weather or for emergencies by an Alaskan dog team. After each snowfall the road was partly cleared by snow plows sent out from each camp. Communication was maintained between each camp and headquarters by means of radio, the telephone being considered too uncertain and too expensive to maintain because of the severity of the weather.

While the straight line between Florence Lake Valley and Huntington Lake is only about ten miles in length, a tremendous amount of time was saved by deciding upon an alignment whereby the tunnel, although nearly two miles and a half longer, could be attacked from four additional headings. At a distance of several miles apart two level shafts were



Profile of Florence Lake tunnel showing how the water car ied through it will be used in the chain of hydroelectric plants on Big Creek and the San Joaquin River.

THE construction of Florence Lake tunnel involved many difficulties. The accompanying views show some of the features of this immense project. Top left shows one of the concreted sections of the tunnel. Although driven through solid granite, water seams and fissures made necessary the concreting of approximately 11 per cent of the tunnel. Top right is a view of Florence Lake reservoir site. Center left is a view of the reservoir site from the temporary diversion dam that has been erected to divert the 1925 spring run-off. Lower left shows one of the many electric locomotives with a string of loaded muck cars being hauled to one of the adits. Mucking was done with electric shovels reconstructed to fit the bore. Lower right shows the meeting of crews from two headings following the last blast. So keen was the competition between crews that all records in tunnel driving were broken as the tunnel neared completion. A remarkable esprit de corps was shown by the men on the job at all times.

driven into the base of the mountain at the tunnel level. These entrances or adits are very short in length as they will be sealed up with concrete. With this arrangements six points of attack were established, making a total of six places where crews of three shifts each worked 365 days out of the year on the great job.

The cross section of the tunnel has a width of 15 ft. and a central height of 15 ft. with a roof arched on a 10.875-ft. radius. The tunnel is unlined except where bad ground was encountered, and is expected to give a flow of approximately 1,500 sec. ft. on a grade of 3 ft. per thousand.

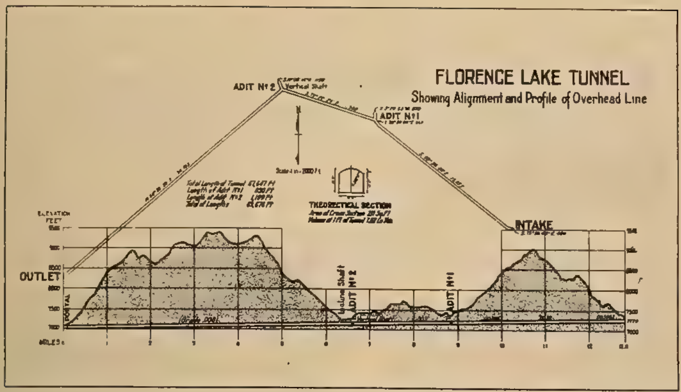
Large Quantities of Steel Drill Consumed

In drilling the tunnel the heading and bench method was practiced, with drills on horizontal as well as vertical bars. Thirty-six to forty-two holes were generally drilled in each heading round. The bench round consisted of fifteen holes and was drilled by four or five machines set on short arms on a cross bar. The drill steel used was made of 1¼-in. hollow round with ⅜-in. core, and was of the best quality. The starter bits were 2¾-in. gage and there was ⅛-in. difference in each change of 2 ft. in length. The finishing steel was 21 ft. long and had a 1⅝-in. gage. The rock was so hard that a piece of steel could seldom be used a second time without resharpening. Between seven and eight tons of drilled steel were handled in drilling a round, and the steel consumption amounted to from fifteen to twenty pounds per foot of tunnel.

The heading was kept about ten feet ahead of the bench. Two 10-ft. rounds were shot at the heading to one 20-ft. round at the bench. The second heading round was shot simultaneously with the bench round, the latter forming a curtain of rock which prevented the heading muck from being scattered too far back along the tunnel. Blasting was done with 60 per cent and 40 per cent strength low-freezing gelatine dynamite in 1¼ x 8-in. cartridges. Electric detonators in eight delays were used in all blasting. Seventy-five to eighty pounds of explosives were used per foot of tunnel.

The tunnels were ventilated through a 24-in. wood stave pipe suspended from the roof by brackets, and a water spray was used at the intake of the pipe to humidify the air, thus preventing drying out of the wood. Wood stave pipe was used because there was less danger of collapse after concussion, and if it were hit by fragments of heavy rock it could be

Artist's conception of the entire Big Creek-San Joaquin project showing the various power houses and storage reservoirs.



Profile and plan of Florence Lake tunnel showing two adits which enabled construction to progress from six headings.

easily patched. The advantage of hanging the pipe from the roof was that gases generated by blasting, which ordinarily arise, were easier to exhaust. After blasting, the fans were run as exhausts for about one hour, then as blowers. The crew was able to resume operations in from 30 to 45 min. after a shot.

Dump cars of 4 to 6 cu. yd. capacity were used, and steam shovels for mucking were built of special size for operation in the available space in the tunnel. These shovels were operated by compressed air, thus greatly reducing the time for mucking. Drilling equipment was standardized, and use was made of X-70 Ingersoll-Rand rock drills.

A great deal of bad ground was encountered in driving the Florence Lake tunnel, and approximately 11 per cent of its total length is concrete-lined. This particular undertaking was carried on while excavation was going on. Most of the lining, which covers the full arch section and includes the floor, was done by the aid of the Webb-Cox type of concrete gun, operated by compressed air.

The substitution of locomotives with a combination storage battery and trolley for those of the straight storage battery type made it possible to haul heavy trains to a point within 800 ft. of the heading, and enabled locomotives to go wherever the track was clear without dependence upon flexible leads or trolley wires which were subject to destruction by flying rock fragments.

In order to provide power for construction work in this tunnel, a 30,000-volt transmission line was built between the various construction camps and Big Creek power house No. 1 at Cascada. The load was carried by a bank of transformers with a capacity of 45,000 kva. The maximum connected load was 12,000 hp., and a total of 41,000,000 kw-hr. was consumed.

Entertainment and recreation being essential for keeping the men satisfied on this isolated project, each camp was equipped with a recreation hall and a reading room, furnished with phonographs, pool tables, magazines and books; and once a week moving pictures were shown, the hours of performance being so regulated that all shifts had an opportunity to view the pictures.

Florence Lake tunnel will carry water from a drainage area of 175 square miles, and it is expected that the water from normal precipitation will fill Huntington Lake two or three times over. This will be made possible by building a dam about 120 ft. high at the intake that will create a storage basin with a capacity of 60,000 acre-ft. In clearing a site for the Florence Lake reservoir about 3,600,000 ft. of timber were cleared and a sawmill established with a daily capacity of 40,000 board feet of lumber which was back-hauled for use at the numerous construction camps.

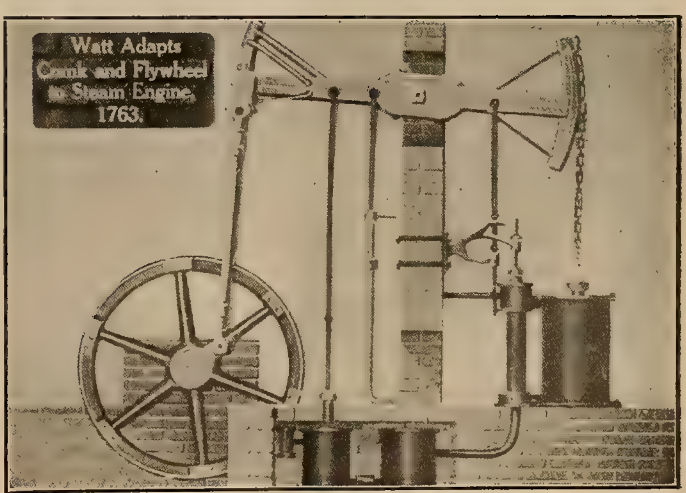
During the period of construction on the Florence Lake tunnel project an average of 2,500 men were constantly employed and the average payroll amounted to over $375,000 per month. Great credit is due those responsible for the management of such an organization, and also to the chemists and engineers who combined to give to the world greater knowledge regarding tunnel construction and who contributed to the development of improved scientific methods, better grades of drill steel, and more efficient explosives.

The Story of Power Told in Motion Pictures

A three-reel motion picture entitled "Power" has been produced by Stone & Webster, Inc., which tells the story of the growth in the use of steam power from the first crude piston engine to the steam turbines of the present day.

Animated drawings have been used profusely throughout the film to show such things as the operation of a steam turbine, just how alternating current is generated, etc. By means of such drawings the location and relative importance of water power are compared with the coal deposits of the United States and a Chinese wall of coal builds itself completely around the United States to illustrate the tremendous quantity of coal mined each year.

The latter part of the film is devoted to actual construction scenes of a large central power station and ends with an animated chart which indicates that this country is just upon the threshold of a period of remarkable power development, which in the next seven years will duplicate all of the central station capacity of the last forty years.



A scene from the moving picture.

Late Developments in the Newspaper Cooking Schools

By Ray W. Turnbull
Assistant District Sales Manager, Edison Electric Appliance Company

IN the March 1, 1923, issue of the Journal of Electricity there appeared an article by Mr. Turnbull on the operation and results of four newspaper cooking schools conducted by the Edison Electric Appliance Company in the larger cities of the Northwest in 1922, the year of their inception. Since that time the publicity attendant upon the conduct of schools in different cities has acquainted many in the industry with the manner in which they are conducted. Recently the plan of their operation has been perfected and their scope enlarged to a point where their effectiveness has increased greatly.

THE value of third-party recommendation formed the germ of the idea back of the newspaper cooking school. It was realized that if some agency outside of the electrical industry could be induced to use the electric range successfully and mention its work favorably, the value of such advertising would be many times greater than the more direct advertising possible to those known to be interested in the sale of the range or the current it consumed. There is a definite limit to the number of prospects that can be reached by direct electric-range demonstration conducted by some agency, such as a power company, known to be vitally concerned in the exploitation of the range. Only those women that are interested in electric cooking will attend such a demonstration, and the attendance is limited to the capacity of the demonstration room of the agency sponsoring the exhibit. But when a newspaper can be induced to sponsor such a demonstration and treat it for the news value, a much wider public interest is secured, as is attested by the attendance of crowds that could be accommodated only in the largest auditoriums, such as the Municipal Auditorium, Portland, the American Theater, Spokane, and the Masonic Temple, Seattle.

It should be borne in mind that the newspaper cooking school is primarily a demonstration of modern cooking—not electric cooking. The electric idea is introduced only incidentally, and the electric range is used, as is frankly admitted by the lecturer, because it is the best agency for the demonstration of modern scientific cooking. In the psychology involved in this thought lies the fundamental strength of the publicity for electric ranges obtained from these schools. If the school were exploited as an electric range demonstration only, the argument would not be nearly so convincing, but when large crowds gather to witness an exhibition of modern cooking methods by a recognized authority, and come away with the idea that these methods can be perfected only through the use of an electric range, the force of the idea has been made stronger, the idea itself more vivid, and the advertising more effective.

A high standard of ethics is maintained at these schools, and the tone of them is sustained through having them sponsored by a number of the most prominent women of the community who are asked to be patronesses, in addition to a newspaper sponsor. Great care is exercised in the selection of the list of these women to see that all elements of the feminine public and private life of the city are represented. In the opinion of the advertising manager of one of the large metropolitan dailies on the Pacific Coast, the annual cooking school has become an institution in the life of the city. The citizens look forward to the event just as they do to other annual affairs of community-wide interest, and this fact furnishes an indication of the success of the movement and of the extent to which the initiators of it have become involved. What started as an experiment in publicity has become a community obligation in several cities of the Northwest, and this renders stability to the enterprise auguring well for its continued and increasing influence on ideas of cookery in that territory.

Baking Contest Popular

The most popular feature of the schools invariably has been the baking contest, in which there are three classes, bread, cake and pie. In each class a number of prizes is offered, of which the first is, for bread, a superautomatic Hotpoint range; for cake, a Thor washing machine; and for pie, a vacuum cleaner of standard make. Other prizes in each class are offered by local merchants and are usually in the form of some food product manufactured or sold by the donor. In many instances free souvenirs have been given by local merchants; for example, in Spokane, the flour mills gave a 5-lb. sack of flour to each entrant in the baking contest, necessitating the donation of almost three tons of flour. It is interesting to note that, although bread-baking is not a common practice in the ordinary home, the number of entries in this class of the baking content has always been greater than in the other classes. This unquestionably is due to the desire of the contestants to win an

electric range, which is the first prize in this class only, and again the interest of women in electric cooking is manifested.

An idea of the popularity of the baking contest can be gained from a glance at the number of entries recorded in the different cities in 1924, of which the larger ones were as follows: Seattle, 1,896, Spokane, 1,193, Portland, 954. The number of entries at the schools in the smaller towns was in each instance proportionately greater than in the larger cities.

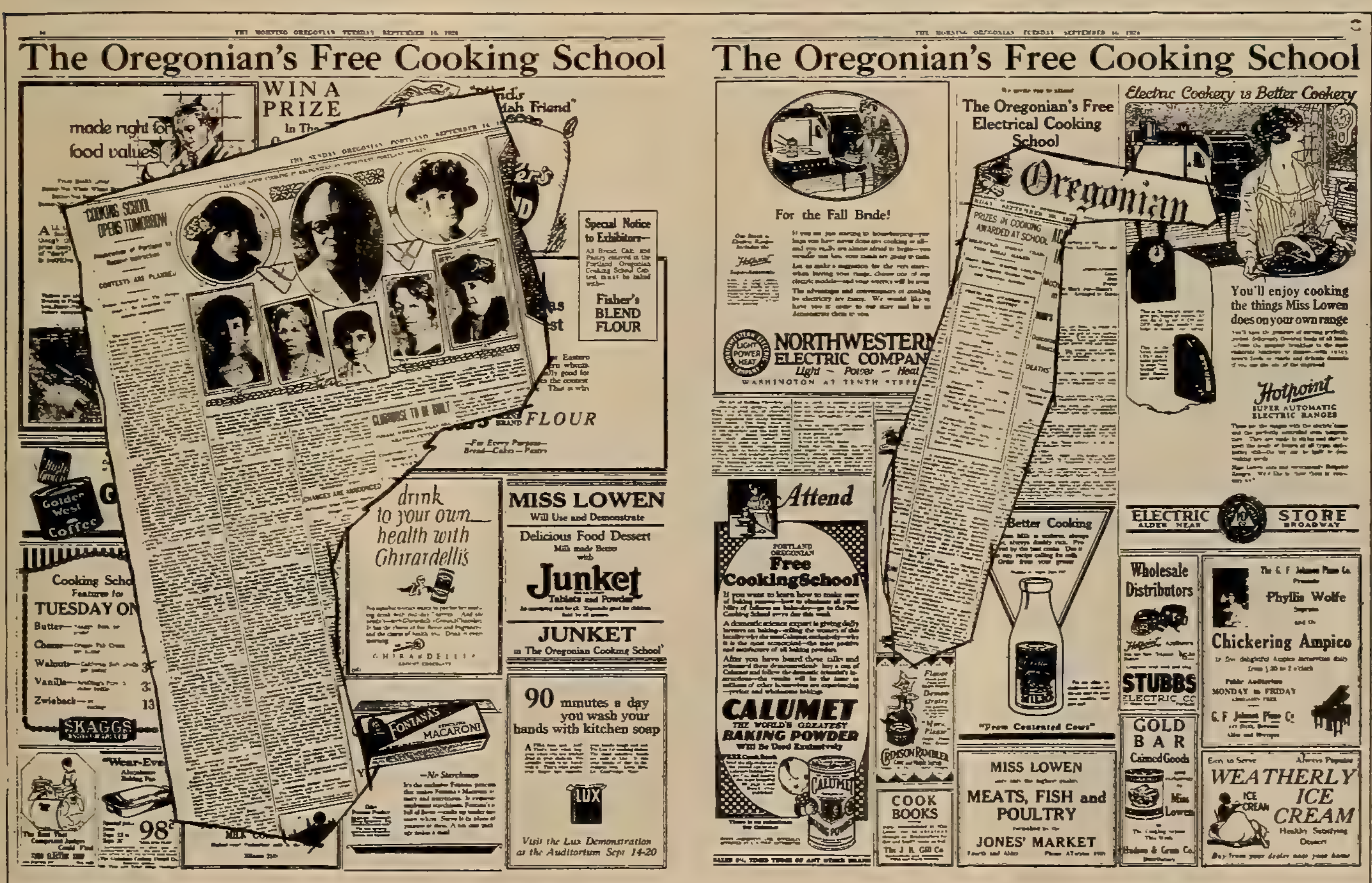
One of the features of the baking contest, productive of excellent publicity for the school, is the auctioning of the prize-winning bread, cake and pie, and in fact all the products entered in the contest, for the benefit of some local charity. As much as $600 has been realized for the charity from this procedure, and naturally this makes an excellent human-interest story which the newspaper can use to advantage in its publicity material. A recent development in cooking-school publicity has been applied in cities where the sponsoring newspaper maintains a broadcasting station. On some evening during the the school session the home economist broadcasts a lecture on modern cooking in which the electric range is emphasized. It is estimated that the lecture in Portland from the Oregonian station KGW reached 50,000 people.

Scope of the 1924 Schools

The principal development in the newspaper cooking schools in the past two years has been the enlargement of their scope by carrying them into some of the smaller cities. The accompanying table presents a list of the cities and towns in which schools were conducted during 1924:

	Population 1924, Est.	Total attendance at school
Portland, Ore.	365,000	8,000
Klamath Falls, Ore.	7,500	1,250
Roseburg, Ore.	6,500	3,000
Medford, Ore.	8,500	2,400
Grants Pass, Ore.	5,400	1,500
Albany, Ore.	6,500	1,800
Corvallis, Ore.	7,500	2,200
Seattle, Wash.	428,000	10,000
Spokane, Wash.	128,000	8,000
Mt. Vernon, Wash.	4,000	1,100
Honolulu, T. H.		3,000
Hilo, T. H.		1,600
Kahului, T. H.		360
Reno, Nev.	12,000	960
Richmond, Calif.	17,000	1,150
Dinuba, Calif.	3,400	1,250
Selma, Calif.	3,200	870
Corcoran, Calif.	1,100	650
Santa Cruz, Calif.	11,000	890
Watsonville, Calif.	5,000	970
Salinas, Calif.	4,300	860
Total attendance		51,810

Two things have been learned through the experiment of taking the schools into the smaller towns: first, that the attendance in them is greater in proportion to the population than in the larger cities; and secondly, that the attendance that can be expected in a town of from 4,000 to 10,000 population is well worth the effort necessary to conduct a school there. It is easy to understand why a smaller town could be made to turn out a greater proportionate attendance. The results in some of the



Double-page spreads made up of advertisements of local dealers were used to direct attention to the school, and news stories appeared throughout the editorial section to stimulate interest. The list of prize winners appeared on the front page of the Portland paper.

towns were gratifying beyond expectations, however, and when the town of Roseburg registered an attendance on the last day of 800, or twelve per cent of its population, surprise was mingled in equal amount with gratification. Such results have tended to strengthen the opinion of some of those engaged in the exploitation of the electric range that, by and large, the people recognize the superiority of electric cooking and are anxious to learn what can be accomplished with the modern range.

High Lights of the Schools

Among the interesting developments found in school technique are the form and use made of the program. Each day of the school every person attending is given a program of work to be done that day in the form of a menu. In this menu are included recipes for preparing and cooking the foods named, and each recipe requiring a baking or roasting operation specifies the proper temperature. Such menu-program serves two purposes in that it makes it easy for the audience to follow the work of the lecturer, and offers a strong suggestion that the electric range is the one medium best adapted to cooking in the modern manner because of the accuracy with which certain temperatures can be secured and maintained. This suggestion of course is amplified by the lecturer from the platform in such a way that the point cannot possibly be missed. At the end of the school session the sponsoring newspaper combines all the recipes into a booklet which is distributed free on request. Indicative of the interest in this feature of the school is the statement that last year the Portland Oregonian distributed 15,000 of these booklets.

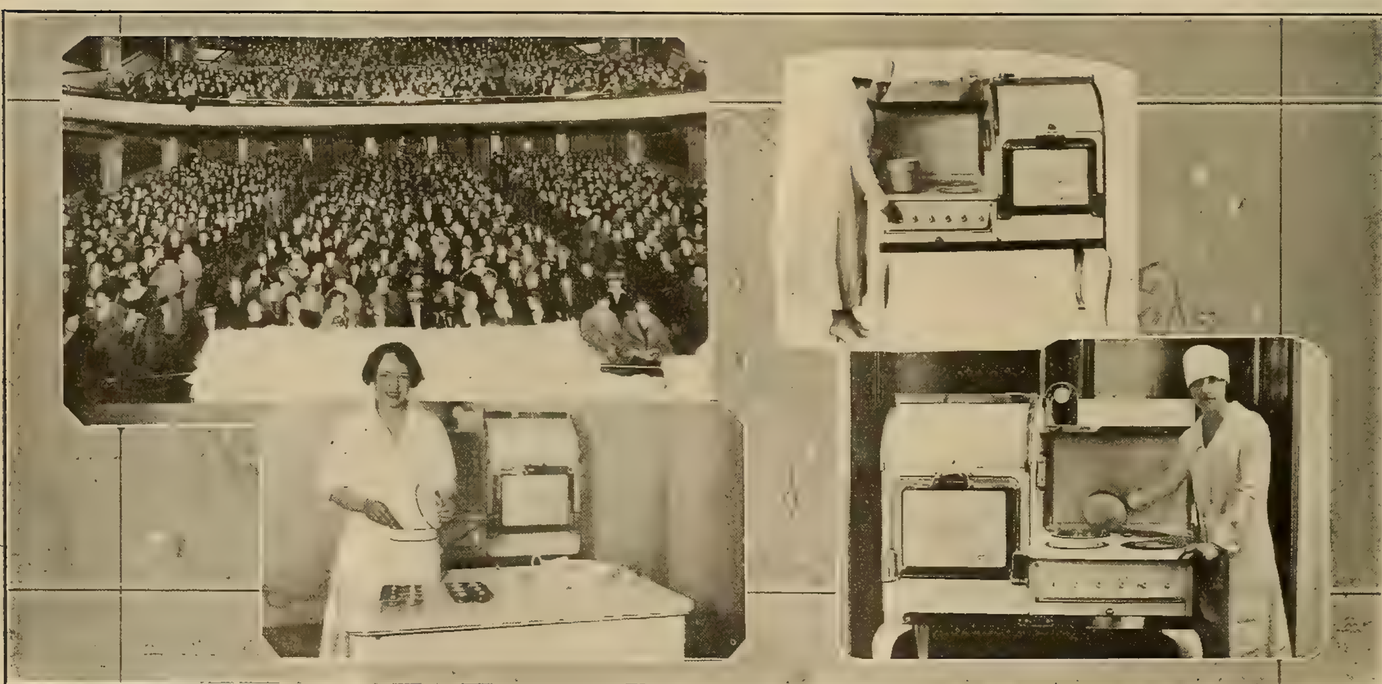
Another interesting feature of the recent schools is the question box. On entering the hall each woman receives with her program a question card, on which she can present in writing any question about her own kitchen problems. These questions are then collected in the question box and later answered from the platform during the class, with the result that wide currency has been given to hundreds of answers having to do with the application of the electric range to ordinary household problems.

Yet another phase is the meat-cutting demonstration, in which on a certain afternoon one of the local butchers takes an hour to cut a side of beef, explaining the value and use of each cut. During this demonstration the home economist explains the proper method of cooking each cut, giving information as to the small amount of shrinkage occurring when it is cooked in an electric oven.

Interesting Experiments in Honolulu

In the Hawaiian Islands it was necessary to go a little further into the fundamentals of electric cookery than seemed necessary in the Pacific Coast cities where more pioneering has been done. In Honolulu a simple experiment was employed to demonstrate graphically how little a roast shrinks in an electric oven. A roast was weighed in front of the class and its exact weight noted. It was then placed in the oven at the proper temperature, and on completion of the cooking operation was removed and weighed again. In the meantime each person present was permitted one guess as to the amount of shrinkage that would result, with the expectation of receiving the roast itself as the prize for the closest guess. This experiment proved to be an entertaining and instructive high light of the Honolulu program.

Another method used in Honolulu to arouse interest in the school took the form of an experiment in baking a ham at night, using the time and temperature control. At the end of one of the afternoon sessions a ham was placed in a cool oven and the



Women in attendance at the Spokane school. The three young ladies who conducted the schools are: (left to right) Miss Bernice Lowen, Miss B. E. Galvin and Miss L. Carol Dangler.

door sealed shut. The temperature control was set for a certain temperature, and the time control was set to turn the current on at 10 p.m. and off at 1 a.m. Each operation was explained to the class, and when all the preparations were completed the class was informed that at the next afternoon's session the seal would be broken, and the ham, still warm and perfectly cooked, would be removed and served in sandwiches. The range was so placed on the stage under a night light that it was visible from the street through the windows of the hall, and during the evening many people paused to look and wonder at an operation possible with no other cooking device. At the next day's class the excellence of the sandwiches attested to the success of the experiment, drove home to the audience the efficacy of the time and temperature control, and added a mute testimonial to the reliability of electric service.

The cooking schools in Portland were announced by full-page advertisements.

A native feast, an ancient custom in the Hawaiian Islands, in which whole carcasses, generally pigs, are barbecued in pits filled with hot stones, is called "luau." The process of luau-cooking takes many hours, and the result is that the meat is very well done so that it readily falls away from the bones without having to be cut and can be eaten without the aid of a knife or fork. It was found necessary to attempt to duplicate the result with the electric range, and at the Honolulu school the instructress actually did this in the oven of her range by cooking a whole pig at a low temperature for twelve hours. This of course was easily accomplished with the aid of the temperature control. The experiment was thoroughly successful, and the natives were made to see that the most modern cooking device yet contrived in our highly complex civilization could produce results considered by them possible only through the most ancient and primitive methods.

Permanent Value of Schools

To the electrical industry as a whole the most pleasing thing about the cooking school is that the interest created is not something that quickly dies. As a matter of fact, it is apparent that the interest developed at the 1922 schools is at the present time just as keen as immediately after the demonstrations. To the central station company and the electrical dealer this is most satisfactory, for through the electric range the attention of the housewife has been directed to many other current-consuming devices with the result that greater opportunities for the sale of other appliances are at present awaiting development by salesmen. Through these cooking schools, conducted as educational institutions, the housewives have gained respect for the ability of electricity to lessen their work, thus further developing the demand for electric labor-savers.

The service offered the housewife in the cooking school is deeply appreciated by those women taking advantage of the opportunity to secure information concerning the latest developments in the preparation of food. An excellent opportunity to capitalize on the good will developed is presented to the central station serving the territory and if, as has usually been the case, a range sales campaign is conducted immediately following the school excellent sales results may be secured.

The sponsoring of the school by a disinterested third party, such as the local newspaper, has been found to be most satisfactory. In addition to the publicity that is given to the demonstration by the paper, the fact that the sponsor has no connection with any agency having anything to sell the housewife is an excellent talking point. Taken from the standpoint of the paper, the results are equally satisfactory as an increase in subscription is usually recorded. Interest in the contents of the newspaper is aroused, and greater returns are realized by all advertisers, thus reacting to the benefit of the publication.

Success Due to Personnel

As has been stated, the electrical idea is only incidental to the school, which purports to expound modern scientific cooking methods. Considerable artistry and technique on the part of the lecturer is necessary to get across to the audience convincingly and without offense, the idea that the electric range offers the best medium for cooking in the modern and most efficient way. In a large measure the success in establishing this impression vividly in the minds of the audience has been due to the home economists that have conducted the schools and delivered the lectures. Last year Miss Bernice Lowen conducted the schools in Portland, Spokane and Seattle; Miss L. Carol Dangler, those in the other towns of Oregon and Washington; and Miss B. E. Galvin, those in Mt. Vernon, Wash., in the Hawaiian Islands and California.

Selling $22 Worth of Appliances to Each Lighting Customer

THIS article, which reviews the merchandising activities of a Middle Western electric service company, is presented because of the Western central station's interest in the sale of current-consuming devices. It is hoped that the experience of this company will be of value to utilities operating under similar conditions. The name of the company supplying the data will be furnished upon request.

PREDICATING its efforts on a definite sales program with a schedule of specific merchandise to be featured during each of the twelve months, an electric utility operating in the Middle West has secured appliance sales volume in excess of $22 per lighting meter consumer per year. The gross sales volume of this company on electrical appliances alone is consistently averaging well in excess of $145,000 per year in communities with a total population of 35,000, and with an average total number of lighting meters in 1923 of 6,320. Coupled with this appliance sales volume is an increase in the use of electricity for lighting of 18 per cent, which may have been affected somewhat by a decrease in rate for lighting service amounting to approximately 15 per cent. This decrease became effective in part of the territory during the last quarter of 1923, and in the remainder during the second quarter of the following year.

The largest city served by this utility has a population of 14,000, and in this community the business is divided between the privately owned utility and a competing municipally owned plant. The smallest community served has a population of about 800, and in this city, as well as in another small city, energy is sold at wholesale to municipal authorities.

Prior to the year 1924, only two offices and stores for the sale of merchandise were maintained by this company, one store being in a city of 14,000, the other in a city of 8,000. During the latter part of the first quarter of 1924, an office and merchandise salesroom was opened in a city of 1,700 population, and during the middle of the third quarter of that year offices and salesrooms were opened in two other towns, one with a population of 1,600, the other having a poulation of 2,400. The average number of lighting consumers served in these cities during the current year is:

City A	2,521
City B	2,739
City C	628
City D	725
City E	1,079

These figures include the total for the districts of which these various cities are headquarters, and contain in addition to the towns in which the offices are located, those small surrounding towns included in the districts.

Sales programs are formulated to take advantage wherever possible of the services of manufacturers' and jobbers' demonstrators. This is found to be an extremely beneficial service, and these demonstrators have proved useful auxiliaries to the regular sales force employed by the utility. All merchandise is sold at list price and prices are never cut, although occasionally a small premium is offered during a special drive on some particular article. Special plans are also employed occasionally, such as allowing, for example, $3 for an old washboard, or $1 for an old coffee pot, to emphasize the value of the article offered for sale. The company believes strongly in personal solicitation and demonstration, and believes further that it is never necessary nor desirable to cut prices in order to increase volume. This attitude has been clearly explained to dealers, in both hardware and electrical lines, who handle electrical appliances, and it has further been made clear to them, that the company will maintain its merchandise advertising. This advertising service has proved of very material benefit to the dealers. No share of the burden of expense has been borne by them, and they have reaped direct and considerable benefit.

Local Dealers Profit

For example, one hardware store that formerly sold three or four electric washers a year, now informs the company that it sells that many per month. The company at the same time is selling from five to ten washers per month in these towns. It has been found that opening stores in the smaller cities has increased greatly merchandise sales of the hardware stores, electrical stores and drug stores that already were handling electrical merchandise in those cities. A friendly relation has been definitely established between the utility and the dealers.

Personal Solicitation Used

Practically all of the appliance-selling by this company is done by personal solicitation. All of the salesmen work on a straight commission basis of approximately 10 per cent. Merchandise is sold at a profit. In 1922, for example, with a total volume of $119,000 of appliance sales the net profit was about 12 per cent of gross; in 1923, with an excess of $145,000 volume the net profit was slightly under 10 per cent of gross. Opening up new offices and other additional expenses will cut down the net for

1924 on a gross of about $165,000 to about 5 per cent of the total sales. The net will undoubtedly in 1925 again show a higher figure, more nearly consistent with the experience of previous years. But profits are figured only after all advertising, soliciting, expenses, salaries, rent, light, heat and other incidentals properly chargeable to a merchandise business are included in the merchandise cost.

Advertising Is Important

There are fourteen weekly and two daily papers in the territory served. The company advertises in all of them and also does considerable billboard advertising. An analysis of the advertising expenses for the first nine months of 1924 shows the following:

	Mdse.	Good Will	Stock Sales	Gen'l Adv.	Total
Bill Board	$ 54.	$ 54.	$ 54.	$	$ 162.
Weekly newspapers	225.	1,500.	1,510.		3,235.
Daily newspapers	2,518.	176.	176.	954.	3,824.
Salaries		375.	375.	205.	955.
Motion pictures	180.				180.
	$2,977.	$2,105.	$2,115.	$1,159.	$8,356.

The sales for the first ten months of 1924 (nine months of which were covered by the above advertising expense) are as follows:

City A	2,521	consumers	$ 59,944	
City B	2,739	consumers	48,268	
City C	628	consumers	10,393	(7½ months)
City D	725	consumers	3,596	(3½ months)
City E	1,079	consumers	2,018	(2½ months)
Total	7,692	consumers	$124,219	

Three regular salesmen are maintained in district A and three in district B. One regular salesman is maintained in districts C, D and E, respectively. In addition, there are a few extra salesmen from time to time, as the company is continually trying out new men. Two additional salesmen easily could be kept busy in districts A and B, provided the right kind of employee could be secured.

Friendly Relations Maintained with Dealers

This utility has consistently broadened and intensified its activities and at the same time has maintained a status of friendly relations with dealers. The company thoroughly has convinced dealers in the territory it serves that it is not its intention to disturb merchandise sales prices, but that it expects to build up the electrical business by the sale of appliances with a resultant increased use of energy. The company cooperates with dealers wherever possible.

The merchandising activities have resulted in a gratifying increase in energy consumption, and in addition to the profit on sales, a continuous revenue has been built up. The executive personnel of this company believes that what has been done in its territory can be done under a comprehensive plan, carefully thought out, within the territorial limits of any public utility, and that the business justifies itself from the standpoint of increased consumption of electricity, improved public relations through the wide contact gained by salesmen, and the profit on the business itself.

Smithsonian Institute Reports on Ontario Hydro-Electric Commission

FUNDAMENTAL differences between government and private ownership and operation of electric utilities as exemplified by the case of the Ontario Hydro-Electric Commission are brought out in a booklet entitled "Niagara Falls: Its Power Possibilities and Preservation" by Samuel S. Wyer of the U. S. National Museum that has been published by the Smithsonian Institution, Washington, D. C. One entire section of the booklet is devoted to a discussion of the contrasting methods of private and government ownership, and the contention is made that a number of fallacies underlie the assumption that the government-supplied energy in Ontario is cheaper than the private supply in the United States.

On this subject the pamphlet states:

"The Niagara River is more than a mere boundary stream between two friendly nations. It is the dividing line between two radically different methods of rendering electric service to the public. In Ontario the plants are owned by the government. In the United States the plants are owned privately but regulated by the government. These fundamentally distinct methods have a definite and far-reaching effect on the economic structures of the two nations, thus:

"1. In Ontario the governmentally owned system sells electric service to domestic consumers at rates considerably below those prevailing in the United States, because: (a) Governmentally owned property is exempt from taxation. This means a gain to the electric consumer of about 10 per cent, with, however, a corresponding loss to the taxpayers, as compared with conditions in the United States. (b) The domestic electric rates are below cost and the loss is made up in part by higher rates for power consumers than prevail in the United States, which places Canadian industry at a disadvantage. (c) Part of the cost comes directly out of the provincial treasury in the form of contributions and subsidies. (d) Part of the cost has been delayed by not making provision for an adequate sinking fund to retire the bonds as they mature, thus placing the burden on a future group of consumers or on the public generally to be met out of general taxation of the entire province.

"2. In the United States the privately owned but governmentally regulated systems sell electric service to domestic consumers at rates higher than those prevailing in Ontario because: (a) Since the property is taxed the tax comes from the consumer, and this alone makes a difference of about 10 per cent over and above the average cost that would prevail if the properties were tax-free as in Ontario. In the United States the electric power utilities paid approximately $135,000,000 in local, state and federal taxes in 1923. (b) Under the scheme of governmental regulation in the United States the rates correspond substantially to the cost of the service. The domestic consumer's cost per kw-hr. is more than the industrial consumer's. This, of course, means that the domestic rate per kw-hr. is higher than the industrial, but it also results in giving the United States industrial consumers lower rates than the industrial consumers in Canada, thus giving United States manufacturers an advantage over Canadian manufacturers. (c) Under the scheme of governmental regulation in the United States the capital invested is not retired, and frequently bonds are refunded. However, the income received from the public in any normal plant provides for at all times maintaining the integrity of the property value. There are no contributions from the public treasury at present or any obligations that must be met out of the public treasury in the future. That is, the United States governmentally regulated method is based on the principle of 'pay as you go' without any deferred debt for the future."

Rate-making principles in the United States and Ontario are diametrically opposed, according to Mr. Wyer, and he bases this contention upon the following statement:

"The major part of the cost of generating electrical energy is fixed and accrues regardless of the output of the plant.

This arises from the large amount of capital that is necessary to rent or hire just to get ready to start, and the then inevitable large capital hire or rental resulting from continuing to stand ready to serve for each of the 8,760 hours of the year. Therefore, the greater the number of average kw-hr. that energy is used, the smaller will be the fixed charge that will be prorated on each kw-hr. That is, increase in hours' use decreases the cost per hour.

"The domestic consumer uses energy but a short time each day, while the average industrial consumer is a long-hour user. Therefore the cost per kw-hr. of industrial energy is less than for the domestic energy.

"The dominating fundamental principle of rate charging in the United States—approved by the state regulating commissions—to make each group of consumers self-sustaining and pay for the cost of the service they are receiving; that is, not to carry one group at the expense of some other group. This means that the short-hour domestic consumer must pay a higher rate than the longer-hour and greater-quantity-using industrial consumer.

"The Ontario method is diametrically opposite. Here the short-hour domestic consumer is arbitrarily, and without regard to the cost situation, given a lower rate than the cost situation would warrant. The loss is made up by other consumers. The Ontario domestic consumers, therefore, are carried at the expense of other consumers."

Exemption from taxation is one of the chief contributing reasons for the lower rates in Ontario, in Mr. Wyer's opinion. On this subject he says:

"The governmentally owned hydro-electric system supplying 79 per cent of the service in Ontario is not taxed. This exemption from taxation, of course, results in lowering the cost of power to the consumer. However, the gain to the consumer in lower rate is equaled by the loss to the taxpayers of the taxing districts in which the property is located.

"The private property of the Canadian Niagara Falls Company at Niagara Falls pays local taxes in Stamford Township equivalent to 76 cents per hp. capacity. If this same rate were paid by the 660,000-hp. governmentally owned equipment located almost entirely in Stamford Township, it would produce local taxes of $501,600. The total annual taxes levied by Stamford Township are $252,000. The privately owned plants at Niagara Falls on the Canadian and United States sides in 1913, with an income of $7,121,928, paid taxes aggregating $1,392,000. For the entire United States about 10 per cent of the dollar the public pays for electric service goes for taxes."

Direct contributions have been received from the Ontario Province treasury for subsidizing rural lines and for other operating expenses, Mr. Wyer states. On this subject he says:

"In Ontario the Rural Hydro-Electric Distribution Act of 1923 provides that '50 per cent of the capital cost of constructing and erecting transmission lines and cables in rural power districts' may be paid out of the Province treasury. This, of course, is merely subsidizing rural electric service at the expense of the public and adding to the tax burden of the farmers. In 1923 and 1924 the amount that was contributed from the Ontario treasury for this special class of service amounted to $1,194,422.

"The Hydro-Electric Power Commission in the past has spent a large amount of money in giving engineering assistance, preparing estimates, making general surveys and rendering electrical inspection service to various municipalities. This has all been paid directly out of the provincial treasury and in no way charged against the governmentally owned operations."

As has been the case with other municipal enterprises the obligation to provide sinking funds has been dodged in Ontario, Mr. Wyer contends. He say:

"When the Ontario governmentally owned hydro-electric system was initiated the hope was held out to the public that the income from electric consumers would pay off the bonds. This has not been accomplished. Contribution to the sinking fund necessary ultimately to retire the bonds, which should have been started at the beginning of operation, has been deferred from five to fifteen years, thus placing on a future group of consumers the burden of return of money used by present consumers. If the money to retire the bonds is not provided for in the rates charged for electric service, it must ultimately come out of the provincial treasury as payment of the bonds has been guaranteed by the Province of Ontario. In the United States the plants must stand on their own feet and there can be no demand on a public treasury.

"The operations of the governmentally owned hydro-electric system in Ontario—up to the town distributing plants, which are owned by the local municipalities—have been financed by two classes of securities: (a) bonds handled by the Hydro-Electric Power Commission, (b) bonds issued directly by the Province of Ontario and the proceeds of the bond sales turned over to the Hydro-Electric Power Commission. Both classes, however, are guaranteed by the Province of Ontario, and the Province is ultimately liable for the interest and sinking fund to retire the bonds."

In substantiation of these statements, Mr. Wyer offers the following statistics:

"On October 31, 1924, the outstanding bonds of the Hydro-Electric Power Commission amounted to $41,768,523. These bonds range in life from ten to forty years. If the electric consumers—as originally contemplated in the slogan-made public opinion of 'service at cost'—had been charged an annual sinking-fund allowance each year which would ultimately retire the bonds out of electric earnings when they mature—on the basis of a 4 per cent sinking fund compounded annually—there should have been on hand at the end of 1924 in the sinking fund to retire these bonds $9,579,107. The accumulated fund actually paid out of rates charged electric consumers to October 31, 1924, was $1,829,461. The shortage existing in the sinking fund is, therefore, $7,749,646.

"On October 31, 1924, the total advances to the Hydro-Electric Power Commission out of the provincial treasury, separate and distinct from the hydro bonds mentioned above, amounted to $138,454.638. This money is supposed to be returned at the end of thirty years. If the electric consumers—as originally contemplated—had been charged an annual sinking-fund allowance each year which would ultimately pay back this money out of the electric earnings at the end of thirty years—on the basis of a 4 per cent sinking fund compounded annually—there should have been on hand at the end of 1924 in the sinking fund to retire these borrowings from the provincial treasury $11,859,541. The accumulated sinking fund actually paid out of rates charged electric consumers to October 31, 1924, was $3,902,495. The shortage in sinking fund is, therefore, $7,957,046.

"That is, future consumers must raise $7,749,646 plus $7,957,046 or $15,706,692 in order to pay for the low priced service that the consumers in the past have received. or this amount must come out of the Province treasury and, therefore, be borne by the tax payers."

In summarizing, Mr. Wyer remarks that money was taken from the provincial treasury and not from earnings for the following purposes: subsidizing rural lines, $1,194,422; general expenses, $2,245,000; Hydro-Electric Commission bonds, $7,749,646; borrowings from the provincial treasury, $7,957,046, or a total of $19,146,114.

Two methods can be followed in wiping out the indebtedness incurred, according to Mr. Wyer. Either the losses may be paid from the provincial treasury and the burden therefore placed upon the entire body of taxpayers, or electric rates must be increased so as to get enough income not only to wipe out the existing deficits but also to make the operation self-sustaining in the future.

In conclusion Mr. Wyer says:

"The gigantic public-ownership enterprise of the Hydro-Electric Power Commission involving many millions was brought into being by a slogan-made public opinion stressing power at cost. In discussing power at cost the following questions were obviously not understood by the Ontario public:

"Merely having service at cost is not enough. The important thing is who pays the cost? The particular consumer who uses the service? Is service sold below cost to one group and the losses made up on another class of consumers? Does part of the cost come out of the general public treasury? For 'at cost' may mean 'at cost of the public.'"

Sir Adam Beck Denies Charges Made in Wyer-Walcott Smithsonian Report

STORMS of protest have been aroused in Ontario as a result of the publication of Mr. Wyer's booklet. Sir Adam Beck, chairman of the Ontario Hydro-Electric Power Commission, makes strong denials of what he alleges to be misrepresentations and misstatements, in a booklet which has just been issued by the commission. In his refutation Sir Adam challenges the qualifications of Mr. Wyer to pass upon the extensive financial and engineering operations of the commission and severely censures Dr. Charles D. Walcott, secretary of the Smithsonian Institution, for his unqualified endorsement of the Wyer report.

According to Sir Adam, Mr. Wyer is chiefly concerned with trying to explain why, notwithstanding the alleged superiority of the United States system, the electric rates, and particularly the residential rates, are so much lower in Ontario than in the United States. He makes unsubstantiated denials of Mr. Wyer's statements that the Ontario system is tax exempt and that certain classes of consumers are supplied with energy below cost. He attributes many of Mr. Wyer's statements to ignorance and questions his ability to pass upon the operations of the largest distributor of hydroelectric energy in the world after "only a few hours investigation."

Portions of Sir Adam's rebuttal follow:

"Mr. Wyer's alleged deficit of $19,147,014 is composed of four items. Under the heading 'Summary of How Ontario Hydro-Electric System Has Failed to Pay Expenses,' Mr. Wyer states 'that the money that has been taken out of the provincial treasury instead of out of earnings is: (1) Subsidizing rural lines, from Section 24, $1,194,422; (2) general expenses, from Section 25, $2,245,900. The accrued deficits in sinking fund that have not been met out of earnings are: (3) Hydro-Electric Commission bonds, from Section 28, $7,749,646; (4) from money borrowings out of provincial treasury shown in Section 28, $7,957,046. Total $19,147,014.'

"There is no more justification for assuming that these expenses (the first two items) should be charged as part of the cost of supplying power to the commission's customers in Ontario than there would be for assuming that expenses similarly incurred by, say, the United States Bureau of Standards or by the United States Geological Survey should be charged against the operations of the power companies of the United States.

"The other two items, which constitute over 80 per cent of the alleged $19,000,000 deficit, are, according to Mr. Wyer, sinking-fund shortages. This $15,706,692 sinking fund deficit, which exists only in Mr. Wyer's imagination, arose in three ways. In the first place, he ignored the fact that the various dates of maturity of certain bond issues of private power companies, which the commission assumed when their properties were purchased, have nothing to do with the periods over which the commission retires its capital by means of sinking funds. Such periods are fixed under the Power Commission act. In the second place, Mr. Wyer made an error of ten years in his calculation of his sinking fund on one issue, which error increased the imaginary deficit by $1,600,000. In the third place, Mr. Wyer ignorantly assumes that, somehow, the commission's large power developments were to commence repayment of their capital cost out of revenue some years before they were sufficiently far advanced in construction to earn any revenue at all.

"The greatest absurdity of his sinking-fund calculations is that Mr. Wyer elsewhere admits, and even stresses the fact, that the cost to the consumers should not include any provision for capital retirement at all. That is to say, according to Mr. Wyer's own definition of cost, the commission has from the consumers collected in its sinking-fund charges about $7,000,000 in excess of the cost. His subsequent conclusion that, by omitting to provide sinking-fund according to his arbitrary scale, the commission has accumulated a deficit of over $15,000,000 can only mean that Mr. Wyer, the Smithsonian Institute's associate mineral technologist, does not even know enough of elementary finance to comprehend the fact that the sole purpose of sinking funds is for capital retirement."

Twenty Years Ago

[Editor's Note.—The material in this column is taken from the Journal of Electricity, Power and Gas, predecessor of the Journal of Electricity. Twenty years ago was chosen arbitrarily because the events and personalities of that period of the electrical industry are within the memory of many of those engaged in the industry today.]

March, 1905

California's Place in Early Electrical History

Of the distinctive pioneering work with which America is credited in the way of electrical invention and development, California is entitled to the first place in more than one important direction aside from that of the electric transmission of power. The following information is of more than passing interest as a contribution to the chronicles of early electrical history in the Far West:

The first successful hotel electric annunciator in the United States was installed in the Grand Hotel, San Francisco, in 1868.

The first multiple-call district telephone box originated in San Francisco.

The first central station for light and power in the United States was in San Francisco.

The first electrically illuminated theatrical presentation in the United States took place at the California Theater, San Francisco.

The first police patrol telegraph was constructed in the snow sheds of the Sierra Nevadas by Engineer L. M. Clements.

The first automatic ringer and the first selective signal in a telephone exchange originated in San Francisco.

The first dynamo plant for telegraph lines belongs to San Francisco.

The first long distance telephone line was from French Corral to the summit of the Sierras, sixty miles, with twenty-four stations.

The first patent office record of the modern electric railway emanated from the patent agency of the "Mining and Scientific Press," San Francisco.

All of the above information was credited to Stephen E. Field, at that time in Stockbridge, Mass.

Plans are under way for the installation of a mammoth searchlight on Mt. Hood during the Lewis and Clark Exposition in Portland. It is planned to use the searchlight to illuminate the snow-capped peaks of Mt. St. Helens, Mt. Adams and Mt. Rainer for the entertainment of visitors to the exposition. Forty high-power arc lights will also be placed on the sides of the mountain for general illumination.

CENTRAL STATION CONSTRUCTION OPERATION AND MAINTENANCE

Largest Turbines in West Designed for Pit No. 3

Gear-Driven Governor and Other Refinements of Design Are Incorporated in 33,000-hp. Units

By E. A. CRELLIN, Assistant Engineer, Division of Hydroelectric and Transmission Engineering, Pacific Gas and Electric Company, San Francisco.

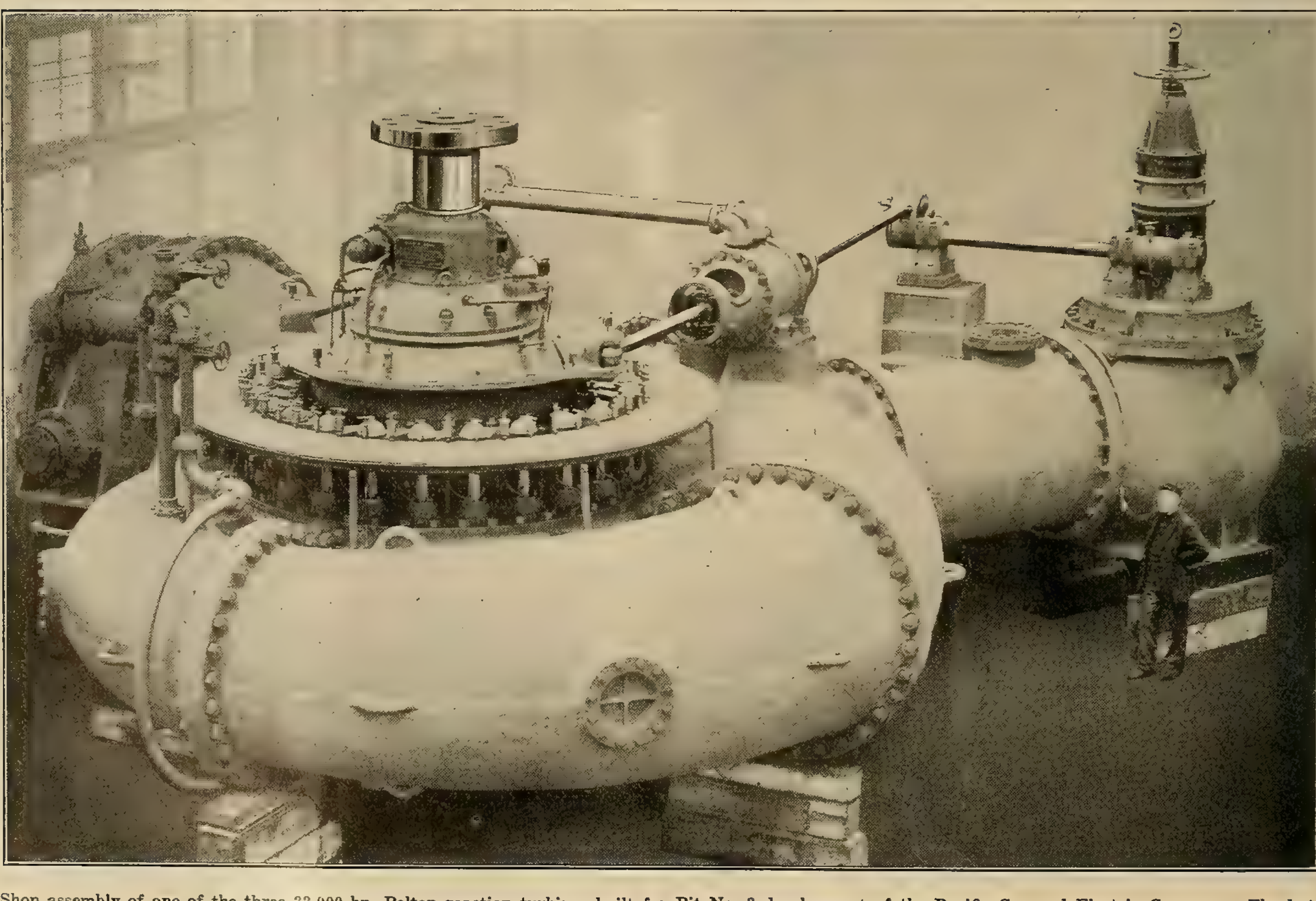
The hydraulic equipment of the Pit No. 3 plant of the Pacific Gas and Electric Company is the largest in physical size to be installed in the West thus far. Each of the three Pelton reaction turbines being installed will develop 33,000 hp. under a net effective head of 280 ft. Special provisions have been made in the design of these turbines to adapt them particularly to operation under the flow conditions of the Pit River.

This plant is the second of a series of hydroelectric plants that will be built on the Pit River ultimately to take full advantage of the total head available from a point on Fall River above Fall River Mills to a point below Big Bend on the Pit, some 60 miles downstream. No appreciable storage is provided at any point on the system as all of the plants are and will be designed to operate upon normal stream flow. This is possible because there is but slight difference between the maximum and the minmum river flow at any time during the year. The porous structure of the lava formation which comprises the watershed forms an underground storage basin efficacious in regulating stream flow within rather narrow limits.

The illustrations accompanying this article give a comprehensive idea of one of the turbines, all of which are now in process of installation at the plant.

Each of the turbines is of the vertical type with the cast-steel casing made up in sections, the largest of which weighs 20 tons. The turbine inlet is provided with a 9-ft. butterfly valve to facilitate complete shutdown. This valve is used also for control of the unit within synchronizing speed at "no load" in case of excessive guide-vane leakage. The valve is operated by an electric motor arranged both for push-button control from a point within view of the valve and remote control for closing only from the switchboard room. Provision is made also for hand operation. It is designed to permit closing against the full flow of water in the penstock, should this become necessary.

The governor servomotors are mounted directly on the turbine casing for operation of the guide vanes and relief valve. The latter is joined with the guide vanes through positive mechanical connection so that the relief valve will open momentarily to bypass water that is rejected from the runner through closing of the guide vanes. The connecting mechanism between relief valve and servomotors is strong enough to block the guide-vane movement in the event of an obstruction of any kind hindering normal operation. Thus the relief valve not only performs a vital function in the control of pres-



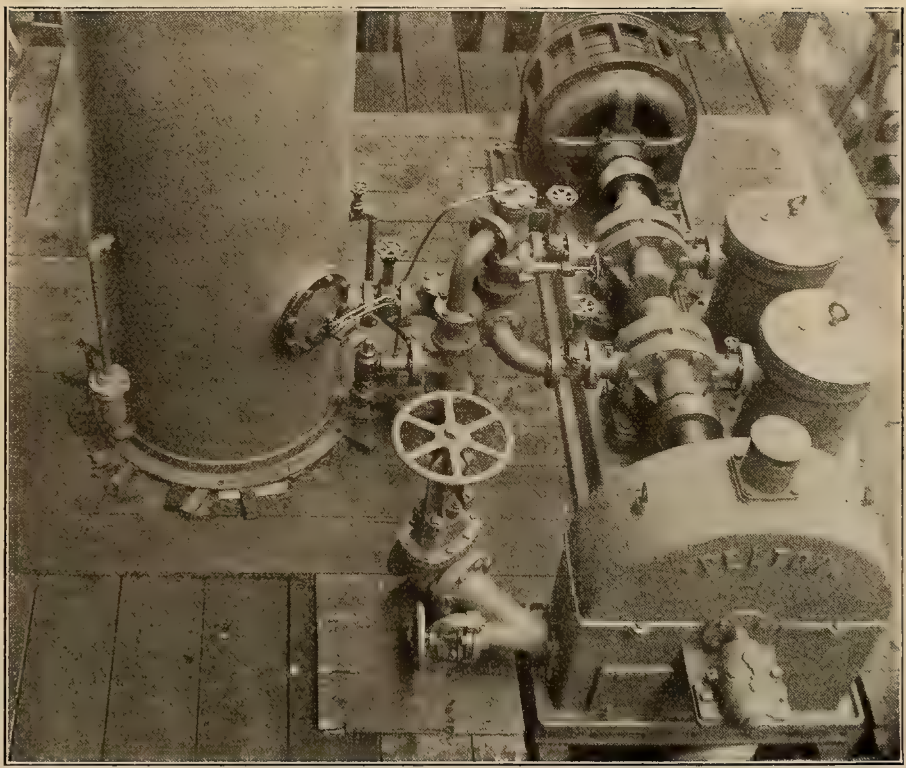
Shop assembly of one of the three 33,000 hp. Pelton reaction turbines built for Pit No. 3 development of the Pacific Gas and Electric Company. The butterfly-valve housing appears at the left and the relief valve at the right where the workman is standing. This unit weighs 90 tons and is designed to operate under a net effective head of 280 ft.

sure rise in the penstock but will also perform the no less important service of providing safety to the unit and to the penstock, should a rupture in the pressure oil piping occur.

An arrangement of helical gears on the turbine shaft drives the governor mechanism, thus eliminating the usual belted connection. Duplicate gear pumps provide lubrication to the main bearing in the turbine. One of the pumps is motor-driven for use during starting, the other is direct-connected to the governor shaft drive, adding load enough to steady its operation. The disk type guide vanes are provided with thrust bearings, and each spindle bearing is lubricated with grease by means of individual hand-operated pressure lubricators.

The runner is made of cast-steel, machine and hand finished. Two of the units will be equipped with rubber seal rings, and the leading illustration shows one of these units to be so equipped. The pipe connections at the left are provided to admit pressure water to the rubber rings since they are water-lubricated. Of the two valves that are shown, the upper one admits water from the penstock that is used for lubricating the seal rings while starting up or when the generators are motored. The lower valve admits water directly from the turbine casing and is usually left open while the turbine is in operation.

A Moody spreading draft-tube is provided with each unit, two sections of which are readily removable to permit

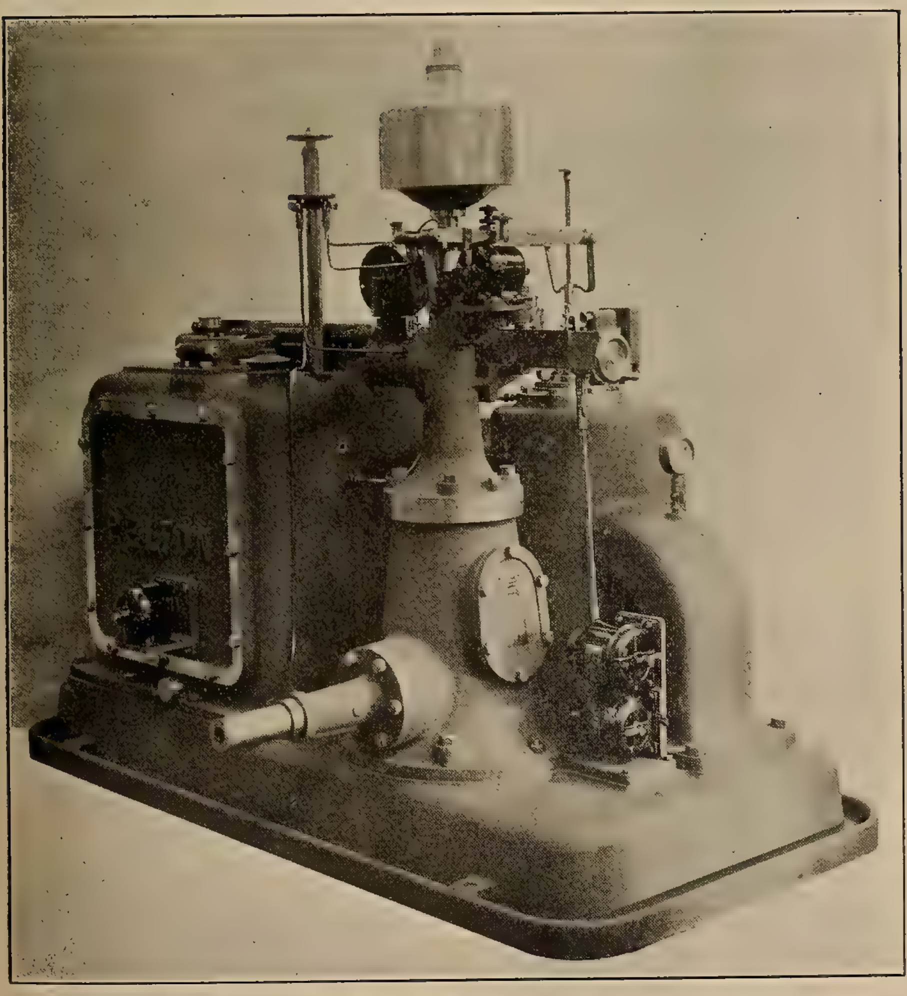


Shop assembly of pressure tanks and duplicate gear-pumps and strainers showing the control valves and piping arrangement which give maximum flexibility. With this system either pump may be shut down for inspection or repairs without interrupting service.

removal of the turbine runner. The turbine shaft is hollow bored to permit the dropping of a cable from the power house crane through the shaft to lower the removable parts, whence they are moved laterally to a hatchway at the side of each unit. To facilitate inspection of runner clearance, suitable holes with removable plugs are provided at convenient intervals through which actual clearance measurements may be taken.

The second illustration shows the Pelton governor actuator which is provided with each turbine. It possesses a number of special features which are especially suited to the conditions under which the Pit No. 3 units will operate. In the foreground will be noted one end of the shaft which forms a mechanical connection with the turbine shaft through helical gears. This arrangement makes for a positive operation of governor fly-balls, and is particularly well adapted to the power house layout since it permits placing the actuator away from the turbine pit in a place readily accessible without dismantling or disconnecting previously adjusted parts, should it become necessary to work upon the generator or turbine.

Complete remote control is provided for the governor actuator. The small motor at the lower right is operated from the switchboard to change the position of the load-limiting device. The motor immediately above it in turn automatically operates an indicator at the switchboard to show at all times the exact position of the load-limiting device. The motor at the lower left indicates at the switchboard the position of the guide-vanes, and the motor near the governor head operates the remotely-controlled synchronizing device. Provision is made for emergency hand control of the governing mechanism,



Governor actuator which controls the speed of the turbine. One actuator is mounted for each unit. The shaft in the foreground is directly connected to the governor shaft on the turbine. The rear bearing of the governor shaft may be seen in the first illustration just below and to the left of where the turbine shaft protrudes through the housing. This direct-connected actuator effects more satisfactory regulation than the older belt-driven type.

and the change over from governor to hand operation is effected by movement of a single lever. The hand-control mechanism is synchronized with the governor control, thus making it possible to switch from governor to hand control without previous adjustment of the hand-control wheel.

A device on the pilot valve stem makes it possible to change the duration of the stroke of the operating cylinder in either direction. A solenoid-operated emergency shutdown is so arranged that the closing of a switch at the switchboard will shut down the turbine. All moving parts of the actuator are lubricated from a single oil reservoir in which the supply of oil is automatically maintained.

The third illustration shows an oil pumping set, one of which is furnished with each of the three turbines. The oil is pumped from a welded steel sump tank through self-priming gear pumps to a welded steel pressure tank, from which point it is delivered to the governor actuator and thence to the servomotors. Each set includes duplicate pumps, one operated by an electric motor and the other by a small Pelton impulse wheel, the latter being used normally during the starting period and thereafter as a standby. Switch-over arrangements make it possible to shut down completely one pump for inspection or cleaning without interruption of service.

The oil pressure sets operate on the the volume-controlled system. When the oil reaches its proper level in the pressure tank, the unloader valve operates to bypass the oil from the pumps back to the sump tank, the entire pumping process being entirely automatic. Should the oil level drop below a certain minimum, an alarm will warn the station operator. Likewise an alarm will sound in the event of excessive oil pressure.

Air pressure to the tank is supplied from an indpendent compressor set operated only at intervals. Provision is made for signals which can be heard at any point in the power house in case the pressure drops below a minimum point.

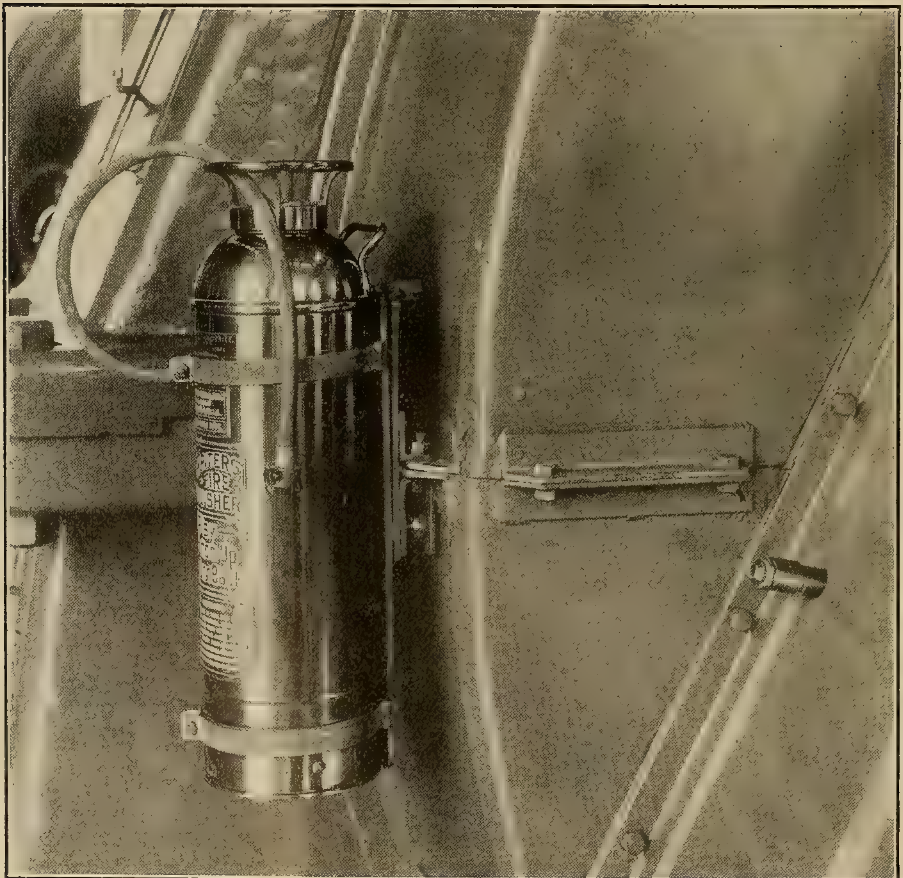
Four Fire Extinguishers Mounted Upon Machine Housing

Fire in the windings of a rotating machine is something which fortunately seldom happens, but when it does happen it may do great damage before it can be effectively fought. While the latest machines are usually piped for either water or carbon tetrachloride, the older units present another problem.

To take care of certain of these installations the Pacific Gas and Electric Company, San Francisco, has developed the scheme of mounting four extinguishers, one on each corner of the machine as shown in the accompanying illustration. These are of either 2½ or 5-gallon capacity, depending upon the physical size of the machine in question.

A strap-iron cradle to which is clamped the extinguisher, is mounted upon a pivot fastened to the housing as shown. A spring-actuated dog serves to lock the cradle in an upright position or inverted as is desired.

The nozzle shown protruding from the machine housing to the right of the extinguisher leads to a spray in the air intake and adjacent to the windings where the rush of air will carry the fluid through. The hose on the extinguisher is fitted with a special coupling which snaps onto the nozzle forming a liquid-tight connection. Thus when a fire occurs within the windings of the machine it takes the operator but about 10 seconds to connect all four extinguishers and swing them to the operating or inverted position.



Fire extinguishers mounted upon the four corners of a synchronous condenser or generator and fitted with a hose to connect with a spray leading into the air duct adjacent to the windings economically bring an older machine up to present-day fire-fighting standards.

Vertical Reaction Unit of 312 kva. Installed in Canada

While everyone is talking about hydroelectric installations of large size, it is interesting to note a similar development in the other extreme. A 312-kva., .8-p.f., 277-r.p.m., 2,300-volt, 3-phase, 60-cycle vertical generator with a direct-connected exciter was recently installed at the Bala Falls, Ontario, plant of the Bala Electric Light & Power Company, Ltd. Mechanical power is derived from a turbine of the Leffel type operating under a net effective head of 18 ft. An oil-pressure governor furnishes regulation and is capable of remote control from the distant switchboard to facilitate synchronizing with the two smaller machines in the old plant. These older machines are vertical, belt-driven units of 112½-kva. and 125-kva. capacity, respectively. The design is the very latest, providing even air brakes of the generator. Contrary to general considerations, vertical type equipment proved to be more economical in this instance than the horizontal type.

Power is supplied at 2,200, 6,600, and 13,200 volts to hotels and residences in the Muskoka resort district.

Aluminate Cement Coming into Production in U. S.

Although aluminate cement has been used in France for about 12 years, it is just beginning to be manufactured in this country. This cement is comparatively expensive, and its high cost is due to an appreciable per cent of aluminum ore. However, its peculiar properties make it especially valuable for certain kinds of work. When mixed, aluminate cement acts like any other cement until it sets. Once set, it gains as much strength in 24 hours as ordinary cement acquires in 28 days.

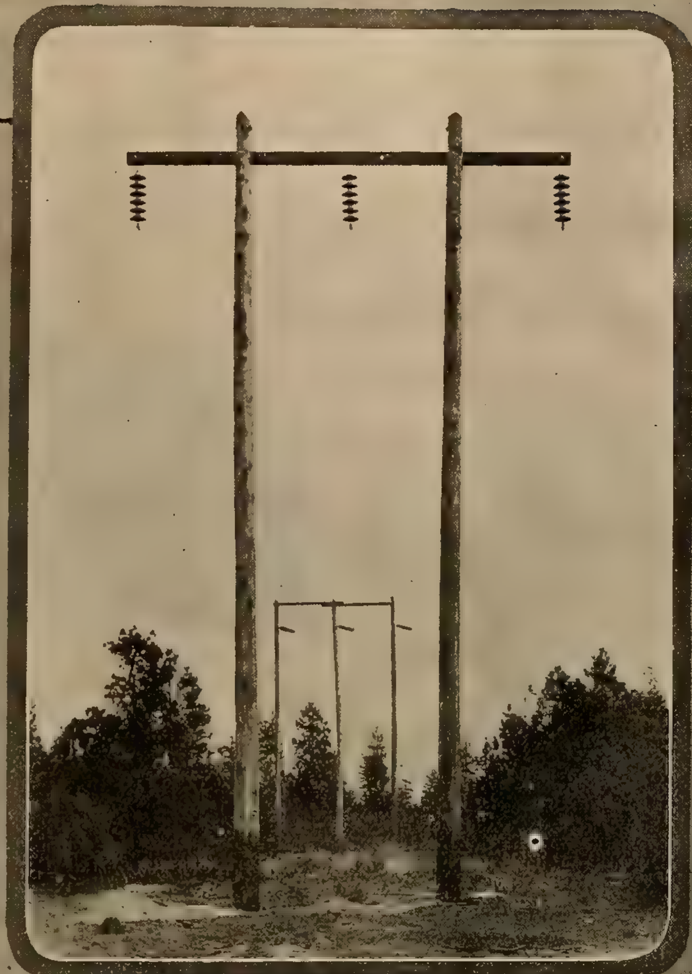
Radio Explained

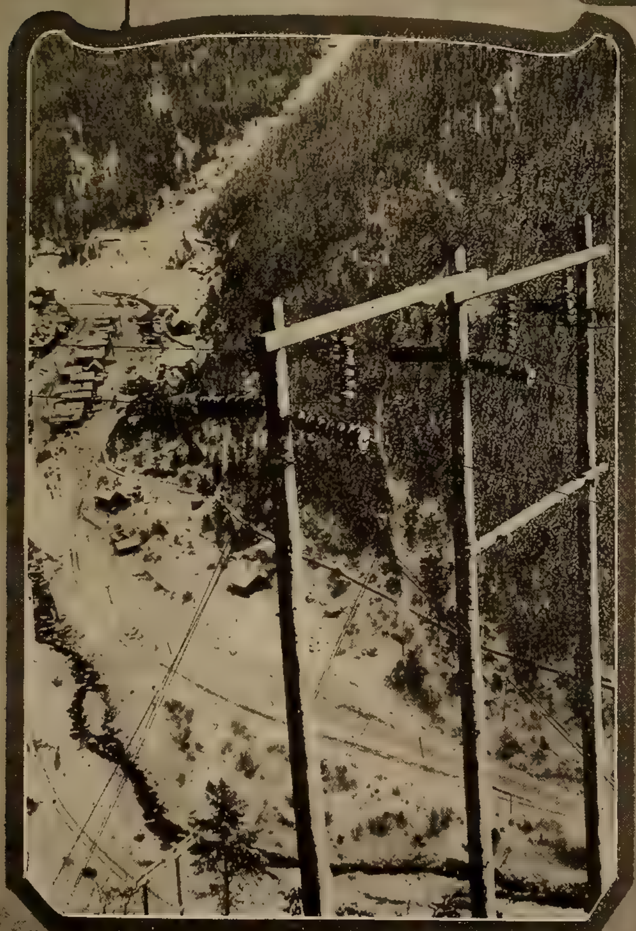
Auntie: "Can you explain the principle of wireless telegraphy, Arthur?"

Arthur: "Well, if you had a very long dog, reaching from Chicago to New York, and you trod upon his tail in Chicago he would bark in New York. That is telegraphy. Wireless telegraphy is precisely the same, only without the dog."

Employees Suggest Many Possible Improvements to Service

Suggestions for service betterment submitted by the employees of the British Columbia Electric Railway netted the traffic superintendent some valuable material recently. It is realized that the employees are in a position to notice many little items and some not so little that could be inaugurated easily and result in better service to patrons. Requests of the company for the suggestions and acknowledgment of their receipt have served to interest the employees in active cooperation to the eventual benefit of all concerned.





Recent Northwestern Construction

WOOD-POLE tower construction used on the new line of the Washington Water Power Company between Spokane and Tekoa, Wash., where transpositions are to be made is shown above at the left. It will be noted that with this construction it is possible to transpose all three conductors at one tower by using double dead-end strings and the one extra suspension string of insulators. The electrical connections are not yet complete on the tower shown. This line is 41 miles long and is built to provide clearance sufficient for operation at 110,000 volts. At the present time, however, it is insulated for and operated at 60,000 volts. Whenever the Chicago, Milwaukee & St. Paul Railway is electrified east of Taunton this line will have to handle more power and will at that time be re-insulated and cut over to 110,000-volt operation.

WASHINGTON Water Power Company transmission lines traverse some difficult country, as is indicated in the scene shown at the left. The town of Mace, Idaho, appears in the left background. The tower structure shown is typical of those used for long-span service on this 110,000-volt line and carries nine strings of Hewlett insulator units.

POWER transmission between Spokane and Long Lake, Wash., is effected at 110,000 volts. Two pole-structures of the line are shown above and represent the latest construction practice of The Washington Water Power Company for lines operating at this voltage. The structure in the foreground is made up of two 50-ft. butt-treated cedar poles set 8 ft. into the ground on 10-ft. centers, and a 22-ft. crossarm. The six units of standard suspension insulators give a clearance of 5 ft. between conductor and crossarm. The horizontal spacing between conductors is 10 ft., which seems to be ample for all conditions. Each conductor is composed of 7 strands of No. 8 copper. Two ground wires will be noted mounted on top of the poles above the crossarms. These ground wires are $\frac{5}{16}$-in. stranded steel cable and are strung for the dual purpose of strengthening the line and protecting it against lightning.

IDEAS FOR THE CONTRACTOR

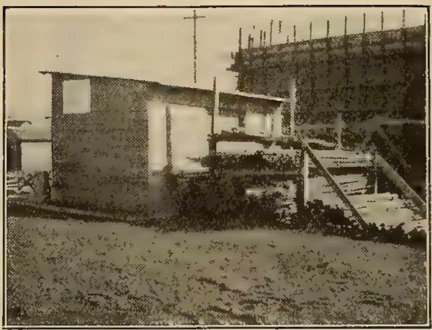
Initiative Aids Electragists in Successful Business

An example of what can be done in the way of business development by electrical contractor-dealers is given by Roy M. Butcher, electragist of San Jose, Calif.

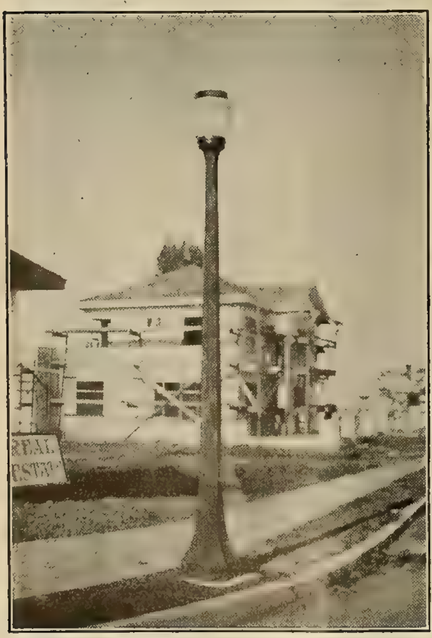
Starting in the contracting business only about seven years ago, Mr. Butcher has by persistent effort and intelligent planning, developed his business to the point where he is now one of the leading contractors of his city. Instead of going after the highly competitive small wiring jobs, Mr. Butcher has devoted his attention mainly to the larger enterprises, such as wiring of schools, public buildings, and similar work. He has also interested himself in the matter of ornamental street lighting for new real estate tracts, and has recently completed the installation of some eighty ornamental standards, such as shown in the accompanying illustration.

The first thing Mr. Butcher does when he goes on a large job is to build a shed or house to hold his tools and supplies. The cost of this house is figured into the cost of the job, and, therefore, the building is constructed at no expense to himself. In addition to this, it saves theft of possibly large quantities of material and valuable tools. The only material that he does not keep under lock and key in this material shed is conduit, which is stacked outside of the house in racks as illustrated.

One of the latest jobs awarded to Mr. Butcher is the complete wiring of an entire tract in San Jose, this tract to be occupied by seventeen strictly modern homes, selling from $18,000 to $24,000 each. Each one of these houses will be completely wired for the fullest possible use of electricity, and will be equipped with electric range, electric water heater, electric refrigerator, electric sink and dishwasher, among other things, radio outlets, and will have convenience and power outlets in each room.



Material shed built on the job by Roy M. Butcher to house tools and materials except conduit which is stacked outside the building.



Westinghouse ornamental street lighting standard installed in a newly opened real estate tract in San Jose, Calif. The lay-out and installation was done by Roy M. Butcher, electragist.

Convenience outlets installed in orchestra pit of a San Jose, Calif., school. This arrangement makes it possible for the musicians to arrange their seats to suit their convenience. Installation was made by Roy M. Butcher, electragist.

Two other jobs of considerable note that he now has under way are two junior high schools, each of which will have unusual provision for the use of electricity throughout the schools and particularly in the various laboratories. An elaborate testing board has been provided for each school, and panel boards of exceptional size and design will be required. Practically all of this work has been developed solely through the initiative of Mr. Butcher, who has striven to add to all jobs as much electrical wiring and equipment as the owner could satisfactorily employ. He has never tried to increase a job merely for the greater profit, nor has he tried to cheapen one by leaving out necessary outlets.

Use of White Pipe Is Favored by Standardization Committee

Industry in all its branches is realizing more and more the necessity of standardization. During the world war the government went into this problem very deeply and we remember how automobile tires were standardized and several sizes eliminated.

To reduce the cost of distribution from the manufacturer to the consumer is probably receiving more thought and study by students of merchandising than any other subject. In line with this the Association of Electragists, through their Standardization Committee adopted a resolution at their annual convention held at West Baden Springs, Oct. 2, endorsing the manufacture and use of "white" pipe and fittings only. There is no logical reason for either the manufacture or use of black pipe and fittings. It means a duplication of stocks, with double investment, added warehouse room, added handling and when all is considered there is no saving made by carrying two stocks.

GIFTS THAT ENDURE

A gift has a body and a spirit. How long does the spirit of the gift last in the mind of the one who has received it? Does it help any if the body of the gift lasts? Does it make any difference whether the gift is useless or useful?

Of course it depends on the person who gives and the one who receives. Some people do not appreciate useful gifts. But there is also a Society for the Prevention of Useless Gifts. When in doubt give a gift that is useful, it will bless the one to whom it is given whether or not you are blessed in return.

A UNIVERSAL GIFT

There is a gift for every son and daughter and father and mother which no one thought of giving ten years ago, and which some stupid people still would never dream of giving. It seems too material and unpoetical.

But a convenience outlet is a real gift. For father a base plug in his favorite corner, and a lamp to go with it. For mother a convenience outlet for her sewing machine, and a motor to run it. For the boy and the girl convenience outlets in their own rooms. Birthdays and Christmases may last the year round.

THE ELECTRIC SHOP

302 E. Wishkah St. Phone 861

Go to a contractor-dealer you trust and have your wiring done on a labor and material basis

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To give a Christmas gift that will endure and will be used and appreciated during its entire life, not only by the recipient, but also by all the members of the family, the Electric Shop, of Aberdeen, Wash., suggests the convenience outlet. Note also the appeal for ethical practice and for mutual confidence contained in the lines, "Go to a contractor-dealer you can trust and have your wiring done on a labor and material basis."

Relation of Credit-Manager and Contractor-Dealer

Constructive Suggestions of Financial Man Help Make a Profit and Aid in Keeping It

BY JOHN BRAY
Credit Manager, Western Electric Company, San Francisco

The financial men of the local jobbers are taking advantage of every opportunity to help the electrical contractor-dealers to become better business men. This idea is not entirely unselfish, for the contractor-dealer who can be educated to use better business methods will eventually be a larger buyer of merchandise and apparatus as his prosperity increases. The successful credit man of today must be a producer. His job is to keep the other fellow right, at least insofar as it concerns the contractor-dealer, who also must be working along the right lines to be successful. The financial man or the contractor-dealer who is not thinking constructively is nothing more than a "tool in the business." It has been, and always will be, a difficult problem to sell the constructive idea to a certain few who may be less experienced, and who, possibly, do little or no constructive thinking in the way of employing better business methods. The situation as a whole, however, with the contractor-dealer has improved very much the same as with the financial man of the electrical jobber. Both have kept pace with the process of development and have taken profit from the world of experience. The educational process must, however, always be continued. Much has been accomplished in classifying the proper knowledge of conducting the business as it should be. The man who can take this knowledge, and use it as his own, has secured the results of both the successes and the failures of others. Success comes only with experience gained by hard work or securing it from those who have worked for it.

Financial interest in business goes back of the mere fact of making the profit safe by collection of the account. It also includes other safeguards to insure a profit after the account has been paid. Unless these are well taken care of, there can be no profit, even after the account has been collected. The start of any effort that is to be profitable must be founded on a basis of knowing the **costs** of either contract work or sales in the store. This information can only be reliably secured by proper records, which to the smaller contractor-dealer does not necessarily mean an elaborate set of books. No contractor-dealer can be easy in mind who cannot tell whether a profit is being made. The item of **"Cost"** is really the most important in any business. It is my belief that it is less understood than that of any other business fundamental. It should be thoroughly understood by the inexperienced, as well as the experienced contractor-dealer. In order to sell merchandise at a profit, it is necessary to add to the purchase price the cost of doing business; that is, expenses plus a legitimate profit. The item of cost must be figured on a basis of **selling prices**, which makes it necessary to figure profits on the same basis. The expenses of any business must first be paid before any profits can be secured. The costs, therefore, must be figured correctly and based on accurately kept records. It is my prediction that the contractor-dealer who does not keep a complete set of records when the business warrants it, will at no distant date be considered a poor credit risk.

Quite often I have gone into a small town in which there were three and at a time, more, contractor-dealers. One will tell you that his competitors are cutting the heart out of everything. A call on the others will result in hearing the same thing. What is the reason? None had a proper knowledge of the cost of doing business, for their records—such as these might have been—did not make it possible for even themselves to know after any job had been finished what its cost had been. Three of the four are not now in business. Profits, if any, were given to customers by low bidding. Ambition for **volume** instead of **profit** killed them off.

In passing here, I cannot help but point out in these cases that the help of the financial man was not constructive but destructive by giving too freely of credit favors instead of holding a check-rein by limiting the accounts so closely that a job would not be taken unless some profit was to be made. This follows, that too much credit is very often worse than a moderate amount. The contractor-dealer should buy only what can be paid for in a reasonable time, and this does not mean more than the usual terms of thirty days or, preferably, cash discounting of bills.

For the protection of the contractor-dealer who really wants to make a success, a higher price must be put on credit by the electrical jobber, which means nothing more than the shortening of terms. The price of credit, the same as the price of merchandise, should be practically the same to all contractor-dealers, which also means that the same terms should be extended to all, except where unusual circumstances warrant some extra consideration. The contractor-dealer who wants to be successful should not ask or expect much time beyond regular terms, if success is to be secured. The "slow-pay" customer eventually fails and the slower the pay the sooner the finish. The "slow-pay" is the one who passes out, so do not get into this class and the chances for success will be that much greater. My experience has been that the "slow-pay" customer is generally not the kind of competitor who is working for success in the same direction as the contractor-dealer who pays promptly, or cash discounts his bills. There are, of course, exceptions, and these are and will always be given proper consideration.

Records must be available so that each case can be proved out on its own merits. Those who are found putting their hands into the till too often, buying expensive automobiles or doing similar foolish things really not with their own money, but with the supplier's capital, must not expect much encouragement in the future from the financial man of the electrical jobber.

In addition to the keeping of proper records, figuring costs, expenses and profits, there are some other things that the successful contractor-dealer must learn to do. In addition to keeping his merchandise investment at the lowest possible figure, the proper turnover of merchandise investment, as well as accounts receivable, must be secured. It must be considered, however, that turnover does not alone make a profit nor does volume alone make a profit, unless the selling price is correct. Volume is important in that it holds down the overhead, while turnover is necessary in order to secure a satisfactory net profit. Turnover is simply the measure of the work of each dollar used in a business. To determine the rate of turnover, divide the net sales, figured at retail, by the average stock on hand, figured at retail, or divide the cost of total sales by the average stock, figured at cost.

Receivable investment is most often out of line due to the fact that the average contractor-dealer generally extends credit too freely and too unwisely, and is not a good collector. Accounts should be carried beyond standard terms only insofar as the working capital will permit. If it must be done on the supplier's capital, that is very poor business both for the contractor-dealer as well as the supplier. A signed order secured at the time work is contracted for, will assist in securing more prompt collections and fewer misunderstandings as to the price of the work. It would be better if less credit were extended to those who are known to be slow pay, for the net profit in the long run would be greater with a less volume of business. The slow account takes a greater effort to collect it, which naturally means more expense by additional work and bad debt losses.

In addition to keeping merchandise and receivable investment at low figures in order to obtain a satisfactory turnover, a small investment in the item of "fixed assets" is most important. This is overlooked by the beginner or less experienced contractor-dealer. It includes cash register, electric sign, adding machine, typewriter, expensive bookkeeping systems, automobile, and store fixtures. At the start of the business, one-half or more of a modest working capital is sunk in these items, which are expense, and assist in hastening the finish even before a start can be made. The item of "fixed assets" is considered of little value as a basis for credit. In fact, when this item is out of proportion, there is an indication that credit dealings should be curtailed or not allowed.

In conclusion, the successful contractor-dealer of the future must be constructive and not destructive, the same as the credit man. In the destructive class must be put the price-cutter and the extravagant one who spends the profits, if there are any, or part of his own working capital, or that supplied by the jobber. The credit man on the other hand must ever keep on teaching the first lesson in business, which is to learn how to make a profit, and the second, how to keep it after it has been made. The contractor-dealer who learns these two lessons well cannot avoid success.

Seattle Firm Gets Everett Wiring Contract.—F. W. Rust & Company, Seattle, Wash., on a bid of $11,138 received the contract for wiring the new North Side Junior High School to be built in Everett, Wash.

Electrical Contractor Electrifies His Own Home

C. L. Chamblin of the California Electrical Construction Company Sets Example for Other Contractors to Follow

Realizing that the men in the electrical industry are not fully qualified to sell complete electrical installations until they are sold on the idea personally and have learned the many benefits of complete electrification at first hand, Clyde Chamblin of the California Electrical Construction Company of San Francisco and Oakland, has recently completed a new home at 836 Rosemont Road, Oakland, which he has made a real example of a modern home. Mr. Chamblin has developed several new features which add greatly to the comfort and convenience of his family.

The central heating of the home is provided by a 3⅓-kw. flush type Wesix air heater located in the entrance hall. This heater keeps the halls warm and also helps heat other rooms when the doors are opened. This practice is out of the ordinary, but Mr. Chamblin has found it to be very effective and satisfactory.

The living room is heated by a portable 3⅓-kw. air heater. This room is provided with a fireplace, which is primarily for appearance and a means of adding cheerfulness to the home. Mr. Chamblin has had a metal shield made which fits into slots at the top of the fireplace that prevents heat loss up the chimney when the fireplace is not in use.

A radio set is provided in the living room, with a loud-speaker plug from this installed in the morning room on the second floor, so that it is not necessary to move the set from its position, radio being easily accessible by merely moving the loud speaker.

The kitchen is equipped with a 10-kw. L and H electric range. Mr. Chamblin installed a special 20-amp. 220-volt receptacle on one end of the range for a 1 2/3-kw. portable air heater. This receptacle is connected on the bus bar of the range through a fuse block, as shown in the accompanying picture.

The table in the breakfast nook is wired with a duplex outlet on one leg near the top of the table; this is joined to a regular connection plug near the bottom of the center leg of the table that connects with the regular appliance outlet in the floor.

Bracket lamps are attached to either side of the mirror on the dresser and chifforobe and are lighted by connecting a flexible cord from them to a regular appliance outlet. This provides proper lighting at all times and further allows a wide flexibility of arrangement of the furniture within the room. General illumination is secured from a central lighting unit.

A 5-kw. Wesix automatic 3-gallon type water heater connected to a 30-gallon boiler provides a continuous supply of hot water. A special valve serves to open or close the circulating path from the heater to the boiler and permits maintaining three gallons of hot water continuously or heating the entire boiler as required.

Each room is wired with a 20-amp., 220-volt receptacle for a portable air heater. These outlets are each on a separate circuit.

There are eight heating circuits and eight lighting and convenience outlet circuits in the home. There are twenty-two single convenience outlets, one duplex outlet, and three floor plugs; seven 20-amp. 220-volt air heater outlets, nineteen ceiling outlets and thirteen bracket outlets. These are controlled by fifteen single-pole switches and ten 3-way switches.

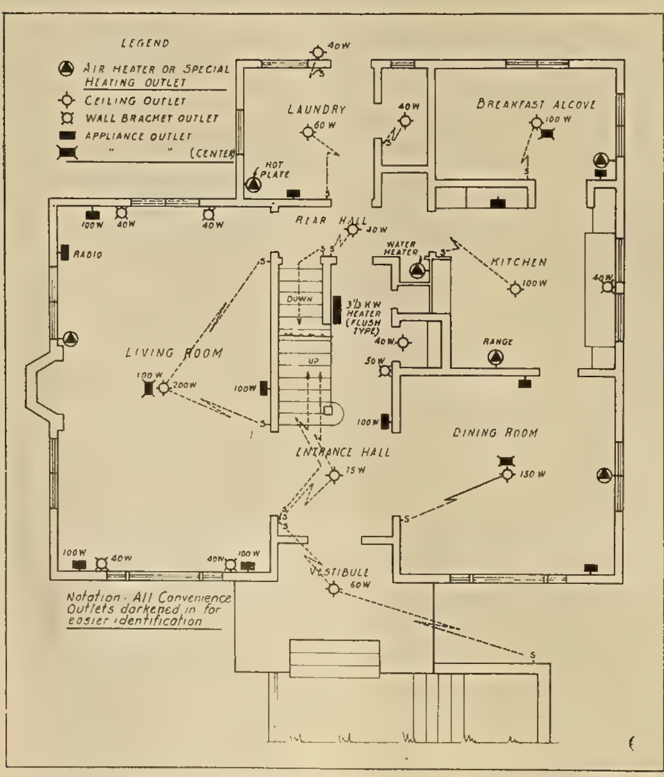
A 3-way switch operates the porch light from the inside hall; another 3-way switch concealed beside the mail box behind the buttress at the foot of the steps also controls this light, so that it may be turned off after going down the steps or on before going up them.

There are four in Mr. Chamblin's family, and in addition to the ordinary domestic routine, there is considerable entertaining. With this large eight-room house the electric bills have been very reasonable. For the period Sept. 6-30 208 kw-hr., which cost $7.13, were used; for the two months from Sept. 30 to Nov. 29 916 kw-hr. with a cost of $25.73. From Nov. 29-Dec. 31, which was one of the coldest months experienced for some time, only 1,441 kw-hr. were used, with a cost of $32.57; from Dec. 31 to Jan. 30, 847 kw-hr. were used at a cost of $20.69. It would have cost as much, if not more, if other fuels had been used. In Mr. Chamblin's mind, this is the closing argument for complete electrification.

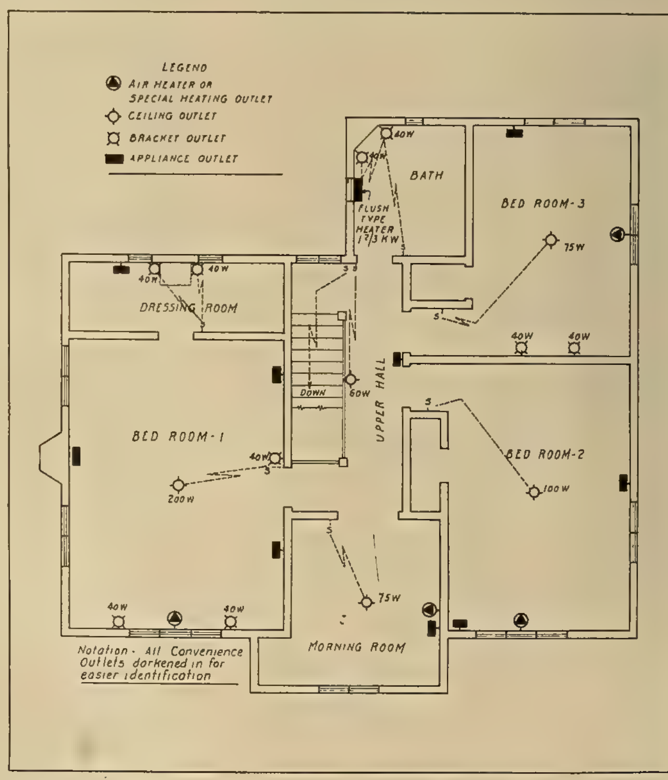
Mr. Chamblin is more enthusiastic than ever, now that his own home is entirely electrified, and he has found it to be a valuable asset in selling new prospects. He has shown the way for other members of the electrical industry, and contractors and others should find his example a profitable one to follow.

E. E. Bogle of Bogle's Electrical Works, 445 Fourth Street, San Rafael, has recently become a member of the California Electragists.

Nutsch Brothers Electric Company, 8217 Tomah Avenue, Rosco, Calif., are the first electrical contractor-dealers to become established in that new townsite situated in the San Fernando Valley.



Main floor plan of the Clyde L. Chamblin home in Oakland. Note the 3-way switch concealed at the foot of the steps to control the porch light; also the numerous air-heating outlets.



Upper floor plan of the Clyde L. Chamblin home. Although not shown, a loud-speaker outlet in the morning room connects with the radio set in the living room.

THE completely electrified home of Clyde L. Chamblin is adequately supplied with all forms of electrical labor-savers. The duplex convenience outlet on the table leg in the breakfast alcove, the special 220-volt heater outlet at one end of the range, and the brackets attached to the bedroom dresser and connected to a convenience outlet, are samples of features that make the home most attractive.

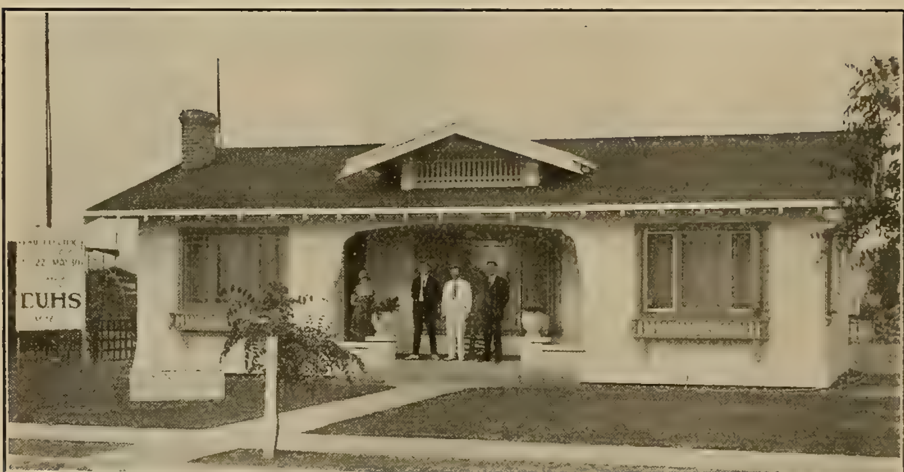
BETTER MERCHANDISING

California High School Exhibits Electrical Home

Exeter Union High School Students Build House Which Is Later Visited by One-third of the Population

An electric home constructed and exhibited under rather novel conditions has attracted considerable attention in California. The home in question was built in Exeter, a city of 3,000 in the San Joaquin Valley.

The house was built entirely by students in the Exeter Union High School enrolled in the manual training classes. The lot on which the home was built was purchased by the student body of the school, and funds to cover the cost of material and such work as was done by local firms were secured through a building and loan association. The actual construction of the house, with the exception of the plumbing and wiring was done entirely by the students in the second-year class in woodworking. The boys in the class worked one and one-half hours each day and the house was completed eight months after it was started.



Exterior of house built by students of Exeter Union High School and exhibited as an electric home.

A six-room modern bungalow was built, the work being done under the supervision of Prof. John R. Alltucker, head of the manual training department. This is the fourth home to be built by the students of the Exeter high school, but the first to be equipped electrically throughout. Wiring in the bungalow was done by the three local electrical contractors, E. M. M. Service, Inc., The Exeter Electric Company and The Carteret Electric Company. The kitchen is equipped with an electric range and water heater. Convenience outlets are installed in each room and outlets for electric heaters are so located as to permit the home-owner to keep the entire house warm at all times. The lighting outlets are well placed and attractive fixtures have been installed in all rooms.

The displaying of the home was placed in charge of E. M. M. Service, Inc., now Merwin's Electric Service. R. S. Merwin, manager, made arrangements for electrical appliances, furniture, rugs, draperies and everything to make the house ready for occupancy. The appliances and interior fittings for the home were supplied by local dealers for the period of the exposition.

The home was open to the public for six days from 3 to 10 p. m. and during that time 1,000 people or one-third of the population of Exeter, passed through it and received instruction as to the place of electricity in the modern home. Three hundred members of the student body of the Exeter Union High School also visited the house and received first-hand information regarding proper electrification of the home.

The method of presenting the idea of the electric home that was adopted in Exeter was found to be particularly well suited to the small town surrounded by many farms. The house was erected at no cost to the electrical industry, and through cooperation with the school authorities permission was secured to display the home to the people of the city. The manual training department of the school also was well pleased with the method of presenting the idea because of the fact that the boys from the city and the neighboring farming country were given a most practical demonstration of the methods of building a house, both through the work that they did themselves and that done by local contractors. Modern practice was followed throughout, and in this way the students were given an idea of what to specify when later they would build homes of their own. From the standpoint of the electrical industry this education of the boys was particularly pleasing for it directed their attention to the necessity for adequate wiring in the modern home.

The cost to the electrical industry in displaying the home has been small, amounting principally to the expense of supervision by the California Electrical Cooperative Campaign's field representative. In Exeter the electrical contractors and dealers were put to some expense, but the results justified the time and money.

The home built by the Exeter high school students was sold before it was finished and an excellent profit made by the school. Other schools in California have considered the erection of electric homes by students in the manual training classes with a view to using the completed houses as laboratories for household-science courses and as investments to be sold later. Second-year classes in manual training are competent to build these houses, and it is possible that in the future many more electric homes will be built by high school students.

Wyoming's First Radio Show Is Conducted in Cheyenne

Getting an attendance of 12,700 in a city of 12,000 population was the record achieved by Wyoming's first radio show, held at Cheyenne, Feb. 5-7. The display was a cooperative project of eight Cheyenne radio dealers and two battery firms. The Winter Garden Dance Hall was leased for the occasion, and booths 6x15 ft. were erected and attractively decorated.

The show was open to the public from seven to ten each evening and for two hours on the afternoon of the final day. Attendance increased each day of the three. The first day's count showed 3,500 present, the second 4,200 and on the third 5,000 people visited the exhibits. Radio enthusiasts came many miles from the country roundabout to visit the show.

Admission was by tickets distributed without charge by the dealers taking part in the show. The entire supply of tickets was exhausted each day and had to be given out again at the door as they were collected inside.

The firms uniting in the presentation of the show were: Cheyenne Construction Company, Cheyenne Light, Fuel & Power Company, Fitch Jeffries Electrical Company, Forbes Music Shoppe, Willard Service Station, Hoskins Music Store, The Klein Company, Knight-Campbell Music Company and Simpson Electrical Company.

The display used by the Public Service Company of Colorado stopped the crowds despite inclement weather.

Novel Displays Increase Washing Machine Sales

Public Service Company of Colorado Branch Offices Use Show Windows to Create Interest in Campaign

When the temperature is below zero in a city where zero weather is comparatively rare, it takes a real window display to stop pedestrians and pull them up, shivering in somes cases, to watch an electrical window display.

That is exactly though, what a window display of the Public Service Company of Colorado at the Boulder office and salesrooms did. The display "went home" in an astonishing manner with Boulder people. Local newspapers actually commented on it. The same display was repeated with equal success in other northern Colorado towns, also at Cheyenne, Wyo., where service is rendered by the Public Service Company. It was one phase of a very successful campaign on electric washers. The campaign and also the window display demonstrated that small cities can put on keen, aggressive merchandising campaigns just as surely as the big city can.

The display which went over was an "Andy and Min" window. "Min," in imitation of the nationally famous Sydney Smith comic strip character, was shown life size at the old-time family wash tub. Arms and body were hinged. She "scrubbed" in old-time fashion. A big card in front of the wash bench read, "Min's Way."

At the other end of the window, "Andy" was shown, life size, in a comfortable chair, his feet across a stand. Near him was a modern electric washer in operation. A big card read, "Andy's Way." Between the two sections of the display there was a card of similar size reading, "Your Way?"

Hanging from the ceiling of the window to a point just above Andy's head, where it functioned as the well-known cartoon "breather," was Andy's exclamation, "Oh Min!"

A clothes line extended across the window at the back, to which a series of display cards was attached with clothes pins. Each card had some talking point of the washer.

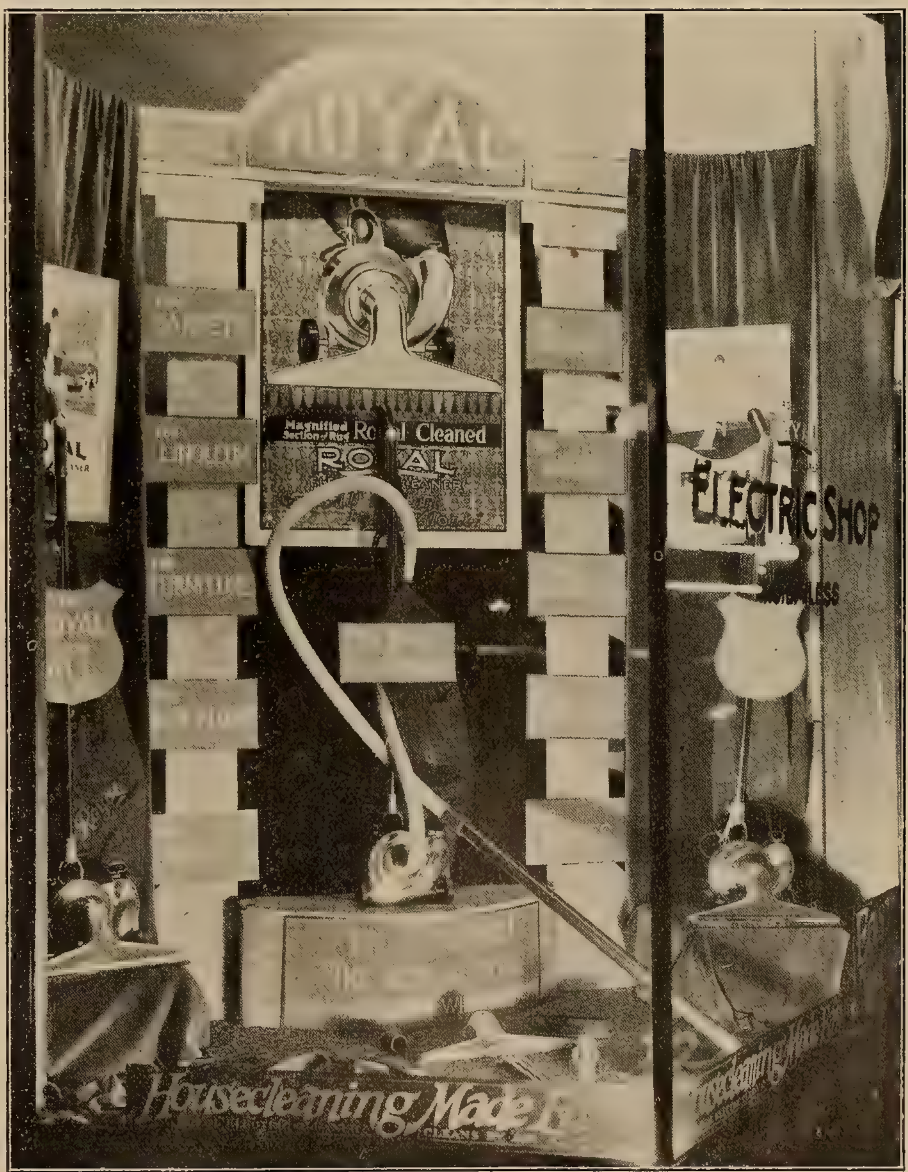
This washer campaign set out to sell 82 washing machines and wound up with a total of 117. Boulder with three men sold 37, Fort Collins and Cheyenne, each with the same number, sold, respectively, 34 and 33. Loveland with two men sold 13 washers. The campaign ran for a month.

Besides the "Andy and Min" display, which was repeated in the three cities north of Boulder, another promotion idea developed in Boulder was repeated with success. Two of the salesmen in the campaign were working in territories new to them and consequently had the problem of developing leads in quick time. Other salesmen, regularly covering assigned territories, of course had some leads accumulated in the days or weeks preceding the campaign.

The Public Service Company made arrangements with a soap manufacturer for a joint demonstration. At Boulder in a grocery store in one section of the town on one day the washer sold was operated, the cooperating manufacturer's soap being used. Both the soap demonstrator and one of the central station men were present throughout the day. The following day the demonstration was put on in another part of the town, and on a third day in still another part. This same procedure was repeated in towns north of Boulder, in each case demonstration coverage of the whole town being secured.

A great many leads were uncovered in this way. At Loveland 75 per cent of all leads used were obtained in this fashion.

Sharp's Washer Shop, newly opened at 531 Santa Monica Boulevard, Santa Monica, Calif., by J. W. Sharp, is specializing on the Thor line of washing machines.



Feature window display of the Electric Shop of W. C. Bailess, Los Angeles, which was instrumental in developing the sale of vacuum cleaners. The display was awarded second prize in a national contest conducted by The P. A. Geier Company, manufacturer of Royal vacuum cleaners.

NEWS OF THE INDUSTRY

Northwestern Electric Bought by American Power & Light

Interests associated with the American Power & Light Company have purchased the majority of the common stock in the Northwestern Electric Company, Portland, according to reports from New York. The sale of the Oregon utility marks the withdrawal of Herbert and Mortimer Fleishhacker from the power industry on the Pacific Coast, they having recently disposed of their holdings in the Great Western Power Company of California to the Western Power Corporation.

The purchase of the Portland property by the American Power & Light Company is of unusual significance as the New York holding company already controls Pacific Power & Light Company, one of the major utilities of the Pacific Northwest. Northwestern Electric and Pacific Power & Light are already interconnected at White Salmon on the Columbia River, and if active management of the Portland property is placed in the hands of the Pacific Power & Light Company it will bring that organization into the light and power business in the city of Portland.

The Northwestern Electric Company serves approximately 19,000 consumers in and around Portland. It has a 15,000-kw. hydro plant at Condit on White Salmon River 70 miles northeast of Portland, and two steam stations totaling 25,000 kw. in the city of Portland. It recently announced plans for the construction of a 30,000-kw. hydro plant at the Yale site on the Lewis River, Wash. Its connected load on Jan. 1, 1925, was approximately 75,000 kw., and its 1924 peak was 32,700 kw.

The purchase of the Northwestern Electric Company is the second active step by the American Power & Light Company in the Pacific Northwest during 1925. It recently acquired control of the Washington-Idaho Water, Light & Power Company of Lewiston, Idaho, at a court sale. The Pacific Power & Light Company, operator of the Idaho property, is constructing a 66-kv. tie-line from Pomeroy, Wash., to Lewiston. (Journal of Electricity, Feb. 15, 1925, p. 150.)

City of Aberdeen Fails To Get Legislature to Act

The attempt of the city of Aberdeen, Wash., to have the Washington State Legislature set aside the decision of the supreme court of the state declaring invalid the bond election providing for a municipal water and power development on the Wynooche River (Journal of Electricity, Dec. 15, 1924, p. 457), was blocked when the senate committee on municipal corporations refused to consider the matter as emergency legislation. The matter was presented to the legislature in the form of a memorial prepared by city officials, requesting that body to validate all proceedings which it had taken prior to the court actions in the Wynooche water and power plan. The refusal of the committee to consider the matter as an emergency measure leaves the disposition of the bill unsettled until the legislature meets again in November, when it will hold an adjourned session. The senate committee action was taken after arguments on the memorial had been made by E. E. Boner, city attorney, and A. E. Cross, former city attorney, in favor of reporting the bill to the legislature as an emergency measure, and an argument by T. B. Bruener, of the Grays Harbor Railway & Light Company, representing F. O. Dole, in opposition. The state supervisor of hydraulics also opposed the memorial in its emergency phase.

In the meantime Joseph Malinowski has offered to the city without charge whatever rights he may have in the Wynooche power site, and the city has accepted his offer. Mr. Malinowski's rights were those upon which the city bond election to finance the power development last year was based.

Way for Temporary Disposal of Hetch Hetchy Power Opened

A way for the temporary disposal of Hetch Hetchy power was opened when the Board of Supervisors of San Francisco on Feb. 24 passed by a vote of ten to seven a resolution allowing the city to dispose of its power through local private distribution systems. The resolution especially prohibits the sale of Hetch Hechy power to the private corporations for resale.

This action is interpreted to mean that the two power companies will be asked to act as the city's agents for the retailing of the power on a mutually satisfactory basis which will be worked out at subsequent conferences of all interested parties. Such a plan of disposal was adopted to avoid violating the terms of the Raker Act, the Congressional Act granting the Hetch Hetchy water rights to San Francisco, that it is claimed prohibits the sale of electric energy to any private corporation for resale. The Department of the Interior in 1918 ruled that while the city could not wholesale power to a private corporation for resale purposes it could appoint such a private corporation as its agent to distribute the power from a construction power plant on the project.

Two other important provisions of the resolution were: that the California Railroad Commission be requested to expedite evaluations of the distribution systems of the Pacific Gas and Electric Company and the Great Western Power Company; and that immediately following the evaluation report proceedings be begun to create a city bonded indebtedness to raise funds wherewith to purchase one or both of the distribution systems. The intent of the resolution is to realize some revenue from the 70,000-kw. Moccasin power plant, which will be ready to go into operation April 1, until such time as the people of San Francisco decide what eventually shall be done with Hetch Hetchy power.

Orders Placed for Baker River Hydro Plant Equipment

Equipment for the first unit of the Baker River plant of the Puget Sound Power & Light Company, under construction by Stone & Webster, Inc., has been specified and ordered. The water wheels are to be of Allis-Chalmers Company manufacture and are specified as two 20,000-hp., horizontal shaft, double-overhung Francis turbines, operated at 200-ft. normal net head at 300 r.p.m. Each unit consists of two turbines with overhung runners, with a guaranteed efficiency of 88 per cent at 19,500 hp. with 215-ft. head, or at 17,500 hp. with 200-ft. head. Controlling the turbines are two oil pressure governors supplied by direct connection to two 150 g.p.m., geared type, oil pressure pumps, also of Allis-Chalmers Company manufacture. Water will enter the turbines through 84-in. Allis-Chalmers butterfly valves.

Direct connected to the turbine shafts are to be two General Electric Company 19,500-kva., 6,600-volt, 3-phase, 60-cycle, horizontal generators. For exciter units there are to be two Westinghouse motor-generator sets, consisting of a 500-kw., d.c. generator and a 750-hp. induction motor. Direct connected to one of these motor-generator sets will be a 720-hp., 200-ft. net head, 900-r.p.m., horizontal, spiral case, Allis-Chalmers turbine.

Each generator unit is to have its own transformer bank, consisting of three General Electric Company 6,667-kva., water-cooled, oil-insulated, single-phase, 60-cycle, 6,600/63,500-volt transformers. One spare transformer will be carried on hand for emergency, making a total of seven transformers ordered.

Radio Freight Rate Hearing to Start March 4.—The California Railroad Commission has arranged to conduct joint hearings with the Interstate Commerce Commission in the proceedings suspending increased rates and charges applying to radio sets and radio sets and talking machines combined. The rates were published to become effective Feb. 15. The tariffs making the advances were suspended by both the federal and the California commissions. The joint hearings by the two commissions will be conducted by Examiner Flynn of the Interstate Commerce Commission and Commissioner G. D. Squires of the California commission, beginning March 4 at 10 a. m., in room 237 Merchants' Exchange Building, San Francisco.

Court Decision Affects Edison Company's Big Creek Project

An injunction by which the Southern California Edison Company is restrained from further impounding water on the head waters of the San Joaquin River in conjunction with its Big Creek-San Joaquin hydroelectric development was granted by superior Judge J. E. Woolley of the Fresno County superior court in an opinion filed at Fresno, Calif., Feb. 13, 1925, in the suit of Mrs. Amelia Herminghaus and others against the Edison company.

The effect of the decision is to prevent the storage in Huntington Lake of water brought from the upper reaches of the San Joaquin drainage basin through the Florence Lake tunnel as well as all additional storage in reservoirs contemplated at Florence Lake, Vermillion Valley, Shaver Lake and Blaney Meadows on the east side development. It also prevents storage on the entire west side development comprising eight storage reservoirs and fourteen power houses on the Middle Fork of the San Joaquin River which are to be constructed following the completion of the present east side development.

Under the terms of the decision water may be diverted into Huntington Lake and thence run through the chain of power houses on Big Creek and the San Joaquin River, but no storage will be allowed other than that coming from the runoff in the Huntington Lake basin. A recent survey indicates that there is sufficient snow in the Huntington Lake basin to fill that reservoir this year. However, one of the chief reasons for the construction of the Florence Lake tunnel was to provide adequate water for the operation of the various hydro plants in extremely dry years such as that just passed. The decision precludes the possibility of such a procedure.

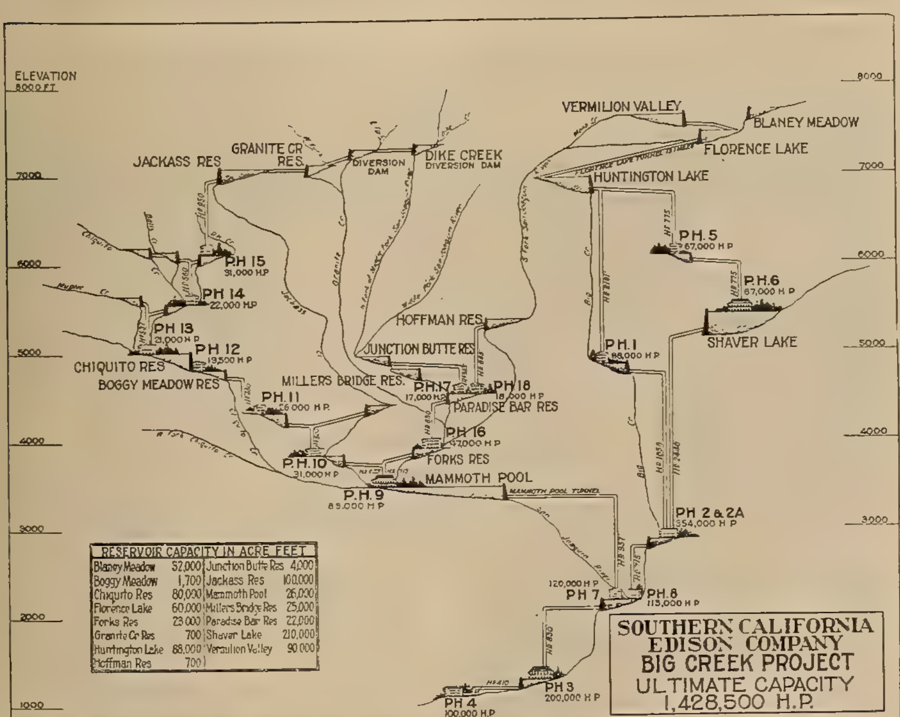
The suit brought by the Herminghaus heirs was filed on the grounds that the contemplated storage of waters of the San Joaquin River in reservoirs for the generation of power prevents the normal spring floods from inundating the lands of the estate and thereby naturally irrigating the land, depositing silt and replenishing the ground water supply, thus damaging the property and interfering with the riparian rights.

The Edison company raised the point that as lessees of the government it was entitled to the riparian rights of the government as owners of the public domain. The court agreed with this contention but held that storage of waters for power generation was not an incident of riparian ownership. Such use was unreasonable, in the court's opinion.

J. F. Truesdell, assistant to the attorney general, appearing for the government, under examination by the court during the course of the trial stated that in his opinion the government has the power as riparian owner of the public domain to store waters from a wet to a dry season.

Irrigationists of the San Joaquin Valley, in the main, were in sympathy with the Edison company, holding that storage of the spring run-off is both beneficial and necessary. It was their opinion that appropriation of flood waters for storage in high reservoirs should be permitted because such waters have no present or future beneficial use to low land riparian owners.

In a statement issued following the filing of the opinion, John B. Miller, president of the Southern California Edison Company, stated that the case would be appealed immediately and that in the meantime active work on the Big Creek-San Joaquin development would proceed along the lines originally intended by the company. This means that construction will continue on the Florence Lake dam and upon such other units of the project as had been contemplated for 1925.



Elevation plan of the Southern California Edison Company's Big Creek-San Joaquin hydroelectric project which is affected by the decision in the Herminghaus case. All of the proposed storage reservoirs with the exception of Huntington Lake are affected by the decision.

Denver Company Will Apply for Franchise Renewal in May

Officials of the Public Service Company of Colorado, on their return from New York last week, announced the decision of the company to apply for a renewal of the present franchise in the city of Denver at the general election May 12.

Whether this matter would be presented to the citizens of Denver at the coming election or final action deferred until May, 1926, when the franchise expires, has been undecided for a number of months. However, the decision to present the request for renewal at the coming election will save the city and company considerable money inasmuch as a special election would have to be called were the matter deferred for another year.

When Clare N. Stannard, vice-president and general manager of the company, presented the resolution of the board of directors to Mayor Stapleton in Denver for his consideration and reference to the city council, it was understood that the city administration was perfectly willing to permit the inclusion of the franchise renewal on the ballot at the next election, although the shortness of time which the city would have for the appointment of a valuation expert to make his appraisal of company property might preclude this action.

The Public Service Company practically has completed all plans in connection with the campaign asking for a renewal of the franchise which will include, it is understood, a revision of rates on both electric and gas service.

Budget for 1925 Is Announced by San Diego Company

The construction program of the San Diego Consolidated Gas & Electric Company for 1925 will not be as heavy as it was for the previous two years. This is true because of the fact that generating capacity sufficient for several years normal growth was installed during 1923 and 1924.

Transmission and distribution lines and equipment will comprise the major items covered by the $2,000,000 budget for 1925. A new line to El Cajon built for operation at 66,000 volts, but to operate for a time at 11,000 volts, is scheduled. Existing lines in National City and Chula Vista will be rebuilt. Portions of the 66,000-volt line to Capistrano in the vicinity of Del Mar and Solano Beach are to be moved.

An addition to the distribution end of Station A will house a new bank of transformers and switching equipment for five new feeders. Improvements to the cooling water system of Station A will be made. A new pipe line will be run into the bay to supply Station B with a larger amount of condenser cooling water. Numerous small shops and storage buildings are also contemplated.

Lighting Institute Opened.—The Edison Lighting Institute at Harrison, N. J., was dedicated by the Edison Lamp Works of the General Electric Company on Feb. 12. Guests of the company at the dedication were conducted through the Institute, which is to be devoted to the advancement of the art and practice of lighting. The development of electric light from its beginning in 1879 is shown in the exhibits.

P.C.E.A. Papers Must Be in Hands of Secretary by April 1

Since the annual meeting of the P.C. E.A. will be limited to one session from 10:30 to 12 on the morning of June 15, the importance of the presentation of the reports of the Sections of the association through the Journal of Electricity was stressed at the meeting of the Executive Committee, held in San Francisco Feb. 19. All papers will be published in the Journal of Electricity and through this presentation the work of the Sections will be submitted to the membership.

The papers will be published in the June 1 issue, two weeks prior to the convention of the National Electric Light Association and must be in the hands of S. H. Taylor, secretary of the local association, 527 Rialto Building, on or before April 1. They will be edited by the papers committee before publication.

The opinion of the Executive Committee was that in order that the work of the present Sections might not be held over until the 1926 convention of the P.C.E.A. that reports be as full as possible and that written discussions on the papers be prepared and presented through the Journal of Electricity. These discussions are requested from members and non-members in order that they may be made a part of the Proceedings for 1924-25.

Discussion during the meeting of the committee brought forth the general opinion that non-members of the P.C.E. A. should not be allowed to serve on the committees of the association, and that if at present non-members are serving on committees the chairmen should make every effort to enroll these persons in the association.

The success of the better lighting schools, conducted by the lighting educational committee of the association, was discussed by the committee and the opinion presented that a great deal of good had been accomplished by the schools which were held in Los Angeles and Oakland. Fifty-five men were enrolled in the Los Angeles school, and reports from those in attendance indicate that much valuable information was presented. The Oakland school had an attendance of over fifty men from the electrical industry who received similar information regarding lighting practice.

A. M. Frost, manager of sales, San Joaquin Light & Power Corporation, Fresno, suggested that a similar group of industrial heating courses be prepared and presented by the association. No definite decision was reached, the matter being laid on the table for further consideration.

Executive committee members present were: Frank A. Leach, Jr., president; S. H. Taylor, secretary; J. F. Pollard, A. M. Frost, R. J. Holtermann, Waldo Coleman, L. M. Klauber, Wm. Baurhyte, P. M. Downing, Clyde Chamblin, and C. T. Hutchinson.

Schedule Maintained on Pit 3 Construction Work

The Pit 3 project of the Pacific Gas and Electric Company is progressing according to the final schedule in spite of the severe weather conditions which have persisted for several weeks. The diversion dam is about 80 per cent complete and work has been carried on unremittingly in spite of the fact that the rainfall has been heavy and that the river recently overflowed the by-pass flume and had to be taken care of through the gates in the base of the dam.

Tunnel work is being pushed and is the part of the job upon which the whole development hinges. It is expected that the tunnel will be the last unit of the project to be completed. All told, the total length is about 23,000 ft. all of which had to be heavily timbered. An over-all average of more than 100 board-ft. of lumber per foot of tunnel is represented in timbering which is made up of 10x12-in. timbers and 2x12-in. planking. Several subterranean reservoirs were tapped, the largest of which took several weeks to drain out. Going to the other extreme, several hundred feet of excavation was through ground so dry that it was dusty. Lining of the tunnel is proceeding at three different places each working three shifts. The progress is about 180 ft. per day total.

Penstocks are laid at the power-house end where they pass under the outdoor bus structure and preparations are under way to extend them up the hill to the manifold.

Concreting of the power house is complete up almost to the eves of the building. One turbine scroll case is embedded in concrete and the foundations for the generator are under way. The second is mounted and levelled ready for concreting and the third is on the ground ready for installation.

Insulators and disconnect-switch mechanisms are being mounted on the bus structure. The buses themselves are for the most part completed. Transformer tanks are being welded preparatory to assembling the units. Clubhouse and operator's cottages are ready for occupancy, and they represent the last word in modern convenience. Practically all material is now on the ground.

University of Oregon Adds New Course in Utilities

Realizing the importance of the subject and sensing the demand for such instruction, the University of Oregon, Eugene, has added this year a second course in the public utilities branch of its department of economics entitled "Public Utility Problems." In this course are discussed such problems as the promotion and financing of utility companies, the movement toward consolidation, public relations, customer-ownership, valuation and rate-making.

The public utilities branch of the department of economics was instituted at the university in 1920 with a course in "Government Control of Public Utilities," which was introduced by way of experiment and has since proved to be popular. This course covers such phases of the subject as government versus private ownership; history, justification, purposes and difficulties of regulation; state versus local regulation; franchises; history, powers, advantages and organization of public service commissions; and similar topics connected with government control.

The public-utility courses are in charge of Merton K. Cameron, who analyzes the purpose of the courses as follows: "Our primary objective in these courses is to point out how intimately public utilities are bound up with modern political, social and economic life, and how complex is their structure, so that those taking the work will possess some basis of fact upon which to act when called upon to pass judgment upon them either as private citizens or public officials."

New Lighting District Formed in Salt Lake City.—A new whiteway lighting district has recently been created by the city commission of Salt Lake City. The new district embraces two blocks on First South Street between State and West Temple Streets. The installation will be similar to that of the State Street whiteway system.

Recent view of Pit 3 diversion dam showing progress made on the structure.

Florence Lake Tunnel Visited by Newspaper Writers

Newspaper men and women from San Francisco and Los Angeles were guests of the Southern California Edison Company at its Big Creek properties Feb. 11-14, 1925, just prior to the final holing through of the Florence Lake tunnel. The party, numbering approximately forty, was conducted over the entire properties. The feature of the trip was a journey through eleven miles of the tunnel and an inspection of the last heading to be holed through.

The following is the personnel of the party:

Mrs. Jack London, Glen Ellen; Miss Florence Muir, San Francisco Chronicle; Harry C. Donoho, San Francisco Call; O. H. Stolberg, International News Reel; W. W. Kofeldt, Pathe News; George C. Tenney, managing editor Journal of Electricity; Wilbur J. Hall, Saturday Evening Post, Los Gatos; Mrs. Wilbur J. Hall, Los Gatos; N. A. Bowers, Engineering News-Record; Mrs. Edwin R. Collins, wife of the managing editor Los Angeles Herald; Mrs. John B. T. Campbell, wife of associate editor Los Angeles Herald; Henry James, editorial writer Los Angeles Express; Mrs. Florence Bozard Lawrence, Los Angeles Examiner; Miss Alice Lawrence, Telegram, New York City; Belle McCord Roberts, Long Beach Press-Telegram; Leslie Dowell, Los Angeles Examiner; Fred Hogue, editorial writer, Los Angeles Times; C. C. Burg, International News Service; George F. Helliwell, United Press, Los Angeles; James Northmore, Los Angeles Examiner, photographer service; William A. Lower, Rollins News Bulletin, San Francisco, Los Angeles, New York; C. N. Alexander, news editor Fresno Morning Republican.

Included among the Edison officials and engineers who acted as hosts were:

George C. Ward, vice-president in charge of construction; H. A. Barre, exectuive engineer; Mrs. H. A. Barre; Charles Heston Peirson, publicity manager; Mrs. Charles Heston Peirson; Edwin R. Davis, manager of construction; Arthur Blight, assistant manager of construction; Harry Dennis, construction engineer; Richard E. Smith, advertising manager; David Munger, traffic manager San Joaquin & Eastern Railroad Company.

Party of newspaper writers and Edison company engineers and officials at the portal of Florence Lake tunnel prior to an inspection trip through the bore.

Funds Secured for Construction of Test Arch Dam

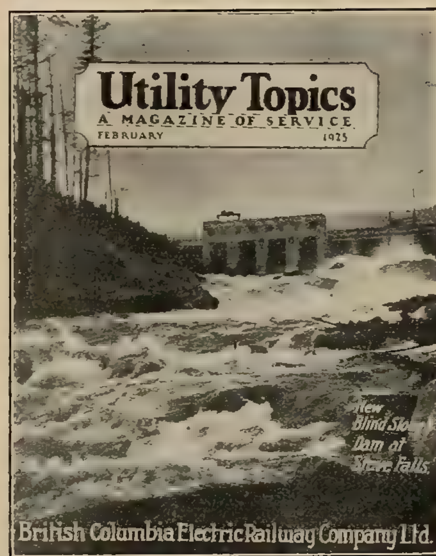
Subscriptions totaling more than $60,000 assure the construction of the experimental arch dam sponsored by the arch dam committee of Engineering Foundation. Work will start as soon as construction details can be worked out. Funds already subscribed total $61,700 which will be sufficient for the first series of tests. The last subscription of $15,000 was from the supervisors of Los Angeles County acting for the county flood control district. In addition to cash subscriptions from eighteen contributors, the California Cement Company has donated sufficient cement for the construction of the dam.

The site tentatively chosen is on Stevenson Creek, a tributary to the San Joaquin River in Fresno County, Calif. It is ideal for the purpose because the nearly vertical rock walls of the creek will keep down the impounded water to only a few acre-feet and further because the flow of the creek can be easily controlled from Shaver Lake.

The purpose of the test dam is to secure much needed data on the design of arch dams. Although such structures have been used for centuries, their design is still largely a matter of theory and it is not known what factor of safety actually exists. With the data which will be made available through these tests together with the results of research by Engineering Foundation on deflection and other deformations of existing dams, engineers hope to be able to design and build structures at a minimum of cost consistent with an ample factor of safety.

New Customer-Relations Booklet Published in Vancouver

To promote good will and to educate its customers in the correct use of electricity and gas, the British Columbia Electric Railway Company, Ltd., has started the publication of a new booklet to be known as "Utility Topics." The first issue of the booklet contains 16 pages and is devoted to pictorial and descriptive matter relative to the use of electric and gas appliances and to the activities of the company in connection with serving the public. One



Cover of new magazine of the British Columbia Electric Railway Company

page of the issue is devoted to a pictorial presentation of the new developments of the company.

Information regarding the fusing of household circuits is given on one page of the first issue. Different types of fuses are illustrated and their use described.

The booklet is printed on a good grade of paper and should be well received by the public. The present plans of the company provide for its publication every other month with a possibility of later making the booklet a monthly affair. A copy of the issue will be mailed with the electric and gas bills in order that every customer of the company may be reached. Duplication of mailing charges is eliminated by this method of distribution.

Hetch Hetchy Line Expected to Deliver Energy to Newark in April.—N. A. Eckart, assistant to M. M. O'Shaughnessy, San Francisco city engineer, has announced that the transmission line from the city's Moccasin plant to Newark will be completed by April 1. The Moccasin plant will be ready to operate at this time, but the bus structure will not be finished, according to Mr. Eckart.

Washington Water Power Budget for 1925 Is $1,480,000.

The recent adoption of the 1925 building program of The Washington Water Power Company, Spokane, authorizing extensions and improvements to cost $1,480,000, has been announced by D. L. Huntington, president. While there are no large outstanding projects on the program, there are literally hundreds of small jobs all over the company's system in the sixteen counties in which it operates, designed to improve service conditions in territory already served. The principal items in the budget are for the completion of all the important transmission line construction started in 1924 but left uncompleted at the end of the year. The next largest items are for substations and distribution lines.

The principal transmission lines listed for completion are the Long Lake-Stratford and the Stratford-Neppel, 110,000-volt lines, and the line from Brewster to Okanogan will be reinsulated for 60,000 volts. Among the substation and transformer increases in the budget the principal item is the East Side substation now under construction in Spokane. A new substation is to be built at Okanogan, and larger transformers are scheduled for Brewster, Stratford, Lind and Neppel.

Growth in the irrigation load in Grant County calls for new transformers and extension of the distribution system in that territory. Provisions are made for a new substation and improvements to the distribution lines in the Coeur d'Alene, Idaho, district.

Puget Sound Company To Install Carrier Wave Telephone

Work on the first unit of a carrier-wave system of radio communication that will ultimately connect the entire power system of the Puget Sound Power & Light Company, will be started by that company within the next thirty days, according to W. D. Shannon, engineer in charge of the Baker River and Dryden hydroelectric projects for Stone & Webster, Inc. The new development, the first of the kind to be undertaken in the state, is designed to establish communication by radio phone between Seattle and Wenatchee and intermediate points during the winter months when other means are apt to fail on account of weather conditions or accident. One of the main features of the system is the fact that high tension transmission lines are used as carriers and that, in event of breakage in such line, the wave will jump between the ends of the break for a distance of as much as a mile.

The first installation of the system will consist of three 250-hp. sets and two 50-kw. sets. An antenna about 1,400 ft. in length will be strung across the Columbia River, and will correspond with similar antenna at the other four stations.

Utah Power & Light Company Acquires Local System.—The Utah Power & Light Company has recently taken over for operation the Home Electric Lighting Company's system at Kamas, Utah. The power company is planning extensive improvements and additions to the present facilities for serving that town, and work is already under way. The Kamas district will become a part of the Utah Power & Light Company's Park City division.

News of the Electragists

San Francisco Association Hears National Officer

The San Francisco Electrical Contractors and Dealers' Association held one of its most successful meetings at the States Restaurant on Thursday, Feb. 19 at noon. The meeting was addressed by Ernest McCleary of the McCleary-Harmon Company of Detroit, Mich. He was the second president of the National Association of Electrical Contractors.

Mr. McCleary outlined some of the history of the national association and vividly explained many of the things that can be accomplished by association activities. He told of the organization of the National Electrical Contractors' Association on July 17, 1901, at the Pan-American Exhibition in Buffalo, and gave the reasons that had prompted the thirty-one charter members to bring about the organization. He stated it had been forced upon them by the unscrupulous activity of the jobbers of that day when prices would change overnight without notice or protection to the electrical contractors. He told of the work of the first joint committee of manufacturers, jobbers and contractors, of which he was the chairman. He outlined his ideal of the proper functions of the three branches of the industry, stating the manufacturer should create and manufacture; the jobber should distribute; and the contractor should install, and further that the contractor should not sell anything that he did not install.

He stated his company would not sell any appliance unless it delivered it, saw that it was properly connected and in operation, and that the user thoroughly understood its operation and use. Although this is an expensive way of selling, he stated it was the cheapest in the long run as it produced satisfied users.

After getting the problem of the jobber situation in hand, he stated the next problem of the national association was the underwriters' rules and their inspectors. He told of the experiences of the first Code Committee and its accomplishments.

Mr. McCleary next told of the organization of the Society for Electrical Development and mentioned some of the things it had accomplished. He expressed his belief that the burden of education rests with the large interests in the industry and that it is their duty to see that the smaller groups appreciate their problems.

He stressed the importance of proper bookkeeping in the electrical contracting business and highly recommended the use of the bookkeeping system of the Association of Electragists, International. He stated that by its use it is possible to make more money with the same volume of business. He highly favored taking something out of his business during normal years and investing it in other ways.

Mr. McCleary suggested that all contracts have a clause in them to the effect that final payment shall be made thirty days after delivery of the inspection certificate, without regard to condition of work of other trades.

The three C's of successful business, as outlined by Mr. McCleary, are Character, Capacity and Capital.

The meeting was well attended by jobbers, manufacturers and others in the industry, in addition to the regular members of the association.

Alameda County Association of Contractor-Dealers Meets

At a recent interesting session Alameda County Association of Electrical Contractors and Dealers held a rather unusual meeting. The occasion was the regular weekly meeting of the association, but Lawrence R. Chilcote had prepared an exceptional program. The meeting was held in the auditorium of the Hebern Electric Code Building, Ninth and Harrison Streets, Oakland, Calif., and was attended by about 200 members of the association and guests. Short addresses were made by Walter F. Price, executive secretary, California Electragists; E. Earl Browne, executive manager, San Francisco Association of Electrical Contractors and Dealers; L. F. Galbraith, superintendent of new business, Pacific Gas and Electric Company, Oakland; F. H. Woodward, general sales manager, Great Western Power Company, San Francisco; and several others. A member of the builders exchange, Oakland, described conditions within the paint industry and a very interesting talk was given by Major Levenson, radio expert of the Western Electric Company. After the general meeting, which adjourned about 9:30 p.m., refreshments were served through the courtesy of The Electric Supply Company, which occupies a portion of the Hebern Electric Code Building. Ed. Watkins, proprietor of the Electric Supply Company, with the assistance of a caterer had prepared an elaborate cold lunch, which was heartily enjoyed by all present. The evening closed with an inspection of the premises and the new quarters of the Electric Supply Company.

Representatives of the electrical industry of the entire San Francisco Bay territory attended the meeting, which was notable for the cooperative spirit displayed.

The California Electrical Construction Company of San Francisco and Oakland has recently been awarded the electrical contract on a warehouse for the Pacific Gas and Electric Company at Emeryville. The building will be an exceptionally well lighted warehouse, and will represent the last word in electrical construction. The electrical contract will amount to approximately $12,000. This is one of a group of buildings to be erected by the Pacific Gas and Electric Company at Emeryville.

Thomas Day Company recently completed the installation of fixtures for the remodeling of the Sacramento Hotel, Sacramento.

California Electragists' Quarterly Meeting at Sacramento

The regular quarterly meeting of the California Electragists was held at the Travelers Hotel, Sacramento, Feb. 14. Humboldt County members drove to San Francisco, passing through the flooded areas in Marin County, to join the delegation from the Bay district and to make the trip to Sacramento with the central California members. More than ninety members from the San Francisco Bay territory, central California, and elsewhere, made the trip to Sacramento and return on the Southern Pacific steamer Navajo which had been chartered for the trip by Walter F. Price, executive secretary of the association. The steamer left San Francisco at 5:30 p. m., Friday, Feb. 13, and left Sacramento on the return trip at 5:30 p.m. Feb. 14, arriving at San Francisco early the following morning.

The executive committee meeting was held at 10 a.m. The general meeting, at 1:30 in the afternoon, was attended by about two hundred members, including a strong representation from Eureka. The speakers at the open meeting included Laurence W. Davis, general manager of the Association of Electragists, International, New York City; C. B. Kenney, manager, NePage, McKenny Company, San Francisco; E. E. Browne, general manager, San Francisco Association of Electrical Contractors and Dealers, and C. L. Chamblin, president, California Electrical Construction Company, San Francisco. Mr. Davis informed the meeting of the success of his efforts in southern California and stated that plans are now being worked out for affiliation covering a statewide organization.

This meeting was one of the best ever held by the association, and the success of the occasion was largely due to the efforts of Mr. Price, who had prepared an exceptional program.

Theodore Kent of the Kent Electric & Hardware Company, 240 3rd Street, San Francisco, has recently become a member of the California Electragists.

A list of thirty-two San Francisco hotels has been prepared for the committee by the San Francisco Convention and Tourist League, giving information as to the character of accommodations offered and the range of prices. A map of San Francisco is being sent with the hotel information. It is desired that the members of the association make their selection from this list and return their applications to the committee promptly in order that all reservations may be made satisfactorily. Applications will be filled in the order they are received.

In order that the better known hotels of San Francisco may be kept available for Eastern delegates to the convention, Mr. Heise has recommended that local men, well acquainted with hotel accommodations in San Francisco, select reservations at those hotels that are not as well known. If this is done it is felt that the hotel committee will be better able to comply with the requests of all applicants.

Western Men Attend Meeting of N.E.L.A. Technical Section

The Cleveland meeting of the Technical National Section, National Electric Light Association, was attended by six delegates from the Pacific Coast. P. O. Crawford, the California Oregon Power Company; E. Y. Porter, The Southern Sierras Power Company; C. E. Schnell, San Joaquin Light & Power Corporation; George Searle, Pacific Gas and Electric Company; C. H. Jenkins, Los Angeles Bureau of Power and Light, and R. R. Cowles, Pacific Gas and Electric Company, carried to the Eastern conclave the message of what the Pacific Coast is doing. The national convention to be held in San Francisco in June of this year was well advertised by this group. According to reports, it is the intention of the Eastern sections to send large delegations to this convention. In fact practically everybody interviewed avowed his intention of coming.

The problems confronting the overhead systems committee and the underground systems committee in a national way seem to be more closely in line with Coast problems than those of the other technical committees. High-voltage cable testing and underground transformer vault ventilation were discussed at length. Even though the underground installation of distribution transformers is not the common practice that it is in Pacific Coast cities, the problem of properly ventilating these vaults is in many cases a serious one for our Eastern brothers in the industry. It seems to be common practice to remove the inner covers from the vault manholes and to use perforated outer covers to induce a draft through the conduits. This practice has been found to greatly reduce the possibilities of explosions in vaults due to accumulation of gases.

Revision of the overhead line construction handbook is under way by the overhead systems committee. The book has been divided into thirteen sections and the sections distributed to different members of the committee throughout the country. Two have been assigned to the Pacific Coast. R. E. Cunningham, Southern California Edison Company, is working on the revision of a section on protective apparatus, light-

Pacific Coast Electrical Association

Hold Technical Section Meeting in Fresno March 25-27

The Technical Section of the P.C.E.A. will hold its third and final meeting for the present fiscal year at Fresno, Calif., March 25-27. The work of the year will be put into final form at this meeting. A good attendance is especially essential since the national annual convention will be held in San Francisco in June.

Headquarters will be established at the Fresno Hotel and business meetings held at the nearby San Joaquin Light & Power Corporation Building. Hotel accommodations may be arranged for directly with the hotel or through C. F. Gilcrest of the San Joaquin Light & Power Corporation.

Schedule of Meetings.

BUREAU	Wed. Mar. 25 a.m.	Thur. Mar. 26 a.m.	Fri. Mar. 27 a.m.
Hydraulic Power	10:00		
Underground Systems	10:00		
Meter	10:00	9:30	
Accident Prevention	10:00	9:30	
Overhead Systems	10:00	9:30	9:30
Apparatus		9:30	9:30
Inductive Interference			9:30
Prime Movers			9:30
Safety Rules			9:30
	p.m.	p.m.	p.m.
Executive Committee	6:30		4:00
General Meeting		8:00	

Applications for N.E.L.A. Hotel Reservations to Be Mailed

Complete information concerning hotel accommodations for the forty-eighth annual convention of the National Electric Light Association to be held in San Francisco, June 15-19, will be sent to the members of the association on March 7 by the hotel committee, C. E. Heise, chairman. With this information there will be application blanks providing for the listing of three choices in the matter of hotel accommodations. All blanks are to be returned to the Hotel Committee, 527 Rialto Building, San Francisco.

All reservations for hotel accommodations for the convention will be handled by the hotel committee. Every effort will be made to furnish accommodations at the first-choice hotel, but in case it is impossible to make reservations at that hotel reservations will be made immediately in accordance with second and third choice. Notification as to where accommodations have been secured will be sent to the applicants as soon as possible.

The hotel committee this year will handle the making of all reservations, securing them at second and third-choice hotels, if necessary, instead of allowing the hotels to route the application blanks to second and third choice when accommodations were not available. In the announcement accompanying the applications the committee states:

"In past years it has frequently happened that a hotel has been completely booked when receiving an application for rooms, and the delay occasioned by correspondence in advising the member or guest resulted in the loss of accommodations also in the hotel next applied to. Through the use of this form which is enclosed it is hoped to avoid all delays of this character and resultant inconvenience to members and guests."

COMING PACIFIC COAST ELECTRICAL ASSOCIATION MEETINGS

Technical Section—
Conclave and Executive Meeting—San Joaquin Light & Power Building, Fresno, Calif. March 25-27, 1925

Commercial Section—
Conclave and Executive Meeting—San Joaquin Light & Power Building, Fresno, Calif. April 3-4, 1925

Pacific Coast Electrical Association—
Annual Meeting—San Francisco, Calif. June 15, 1925

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ing phenomena and grounding, while R. R. Cowles, Pacific Gas and Electric Company, has been assigned the section dealing with mechanical calculations for transmission and distribution lines.

High-voltage transmission is interesting several Eastern companies. Joint use of poles and methods of pole-treating are also items of common importance. Radio interference produced by arcing grounds where trees get into power lines has reacted to the benefit of the power companies in that in many cases civic authorities are now cooperating with the companies in efforts to keep trees trimmed to a point where they will not involve lines. The design and use of steel poles versus wood poles aroused much discussion. The special tests planned for the steel poles which have been designed through the activities of the local overhead systems bureau, as well as the designs themselves, are attracting attention in Eastern circles. Transformer loadings, grounding and grounding methods also were given consideration.

All of the meetings were well attended by representatives from all different geographical divisions, according to reports. Visits were made to many points of interest to the electrical men. The 66,000-volt cable of the Cleveland Illuminating Company was inspected, and many interesting data concerning its operation obtained. The new Crawford Street station of the Commonwealth Edison Company of Chicago gave the Pacific Coast delegates an opportunity to view at first hand some of the largest and latest designs in steam-driven turbo-generators. At this station one 50,000-kw. and two 60,000-kw. units are being installed. The ultimate capacity of this station will be 600,000 kw.

Overhead Systems Bureau Report on Meeting Presented

A report on the Jan. 7-9 meetings of the Overhead Systems Bureau of the Technical Section, P.C.E.A., has been prepared by E. Y. Porter, The Southern Sierras Power Company, chairman, and J. W. Ellis, Pacific Gas and Electric Company, secretary. The bureau held an exceptionally profitable meeting and much business was conducted.

Vibration of transmission-line conductors and the investigation of surges are being studied by the subcommittee on 220-kv. transmission under the direction of H. V. Michener, Southern California Edison Company. The Southern California Edison Company is making a special study of conductor vibration and will probably have some definite information concerning this important subject in the near future.

The placing of double circuits on one structure is a subject which is being carefully studied from both the point of view of construction costs and that of operating characteristics. All companies contemplating the construction of 220-kv. lines will be asked to submit certain information in a report to be made to this committee. This report will enable the committee to keep in touch with future as well as present construction where 220-kv. lines are involved. Surge characteristics of the Big Creek lines have been under investigation through several installations of the klydonograph made by the Westinghouse Electric & Manufacturing Company.

Steel poles as substitutes for wood poles are under investigation by two different divisions of the subcommittee headed by E. H. Steele, Pacific Gas and Electric Company. Design details of both fabricated and expended steel poles such as those manufactured by the Truscon Steel Company and the Bates Expanded Steel Truss Company are being worked out under the direction of Walter Dreyer, Pacific Gas and Electric Company.

Tentative specifications have been worked out and are as follows:

Height	63 ft.
Depth of setting	8 ft.
Base for concrete setting	15 to 18 in. square
Base for earth	20 in. square
Top	15 to 18 in. square
Vertical conductor spacing	6 ft.
Horizontal conductor spacing	11 ft.
Allowable stress at pole top	1,500 to 1,700 lb.
Vertical strain	800 lb.
Weight	1,600 to 1,750 lb.
Spans	400 ft.
Poles designed to carry two 2/0 copper, 60-kv. circuits in vertical configuration as a maximum.	
Cost erected complete	$160 (approx.)

Special poles of the expanded variety have been ordered to specification for test purposes but have not been completed. Steel angles, steel pipe, and channel and wood construction for crossarm construction are under consideration. It is generally conceded that steel poles are stronger, may be set father apart, have no fire hazard, but are dangerous for lines of low voltage that are worked hot, are easier for unauthorized persons to climb, and that the material cost is from 15 to 150 per cent higher than wood poles.

Treating methods and processes were discussed by C. E. Young, Pacific Gas and Electric Company, who reported that a new process has been developed in Central Europe for treating poles. This new method is known as the Woolman Process and is claimed to have none of the objectionable features of the present creosote treatment. The continued twisting of certain kinds of wood poles is to be checked up to determine whether or not full length creosote treatment will prevent this difficulty.

Insulator testing methods are being compiled by the subcommittee under H. H. Minor, San Joaquin Light & Power Corporation. Questionnaires have been sent out, but the results are not yet available.

Overhead line construction costs of the various companies are being studied by a subcommittee under R. E. Cunningham, Southern California Edison Company. The object is to try to develop record-keeping systems which will simplify this work and enable line construction costs of the various companies to be easily compared to the mutual benefit of all concerned.

Standardization of distribution transformers is the subject being handled by a subcommittee headed by N. B. Hinson, Southern California Edison Company. Electrical characteristics are not to be considered for the present at least. However, the committee reported that the present forty different varieties of hangers for distribution transformers could just as well be reduced to three or four. Representatives of manufacturing companies stated that such standardization would be entirely agreeable to them.

Secondary terminals or rigid terminal studs were recommended by the committee in place of the present long flexable leads. Discussion of this seemed to favor such a change.

Revision of General Order No. 64 occupied the full time of the overhead construction rules committee. Representatives of power, communication, and railway companies as well as from the California Railroad Commission cooperated in this work. It is hoped that the work of this committee can be in practically complete form in time for the March conclave.

Book Reviews

APPLIED ELECTRICITY FOR PRACTICAL MEN

By ARTHUR J. ROWLAND. Second edition. 443 pages; 366 figures. $2.50. Published by McGraw-Hill Book Company, Inc., New York, N. Y.

As the title indicates, this book treats the subject of electrical engineering from the standpoint of the man who installs and operates electric circuits and apparatus. It adheres closely to the phases of electrical theory which the electrician engaged in practical work on lighting and power systems should know. The fundamental principles and the explanation of apparatus presented in this book are only such as are needed to present essential elements.

The author as educational director for the Milwaukee Electric Railway & Light Company has seen the need of a book which will assist electrical workers "who expect to make direct application of the principles given them in the class room to their daily work with commercial circuits and machinery." Except where it has a direct bearing upon practical problems, pure theory is avoided and no attempt has been made to go into the problems of apparatus design.

The beginning of the book treats of the fundamental principles of electromotive force; magnets and magnetic flux; E.M.F. in direct-current generators; drum armatures and multiplepolar machines. The principles of electrical heating and electric power are then treated, followed by direct-current systems of distribution and direct-current motors. Alternating currents are then taken up in the order of alternating-current principles; transformers; polyphase-current principles; alternating-current generators; motors and miscellaneous alternating-current machinery. A chapter is devoted to storage batteries, followed by chapters on electric lights, wire and wiring.

One good feature of the book is the group of questions and problems which are given at the end of each of the chapters. This book should serve its purpose well. The explanations are clear; the photographs and drawings are good, and sufficient of the fundamental principles are given throughout to furnish practical electrical workers with a good grounding in the subject. In addition to this, the book should prove of value to college students of electrical engineering as supplementary reading to the class-room work.

E. R. S.

Meetings

Utah Company Officials Address Local Commercial Club

Several officials of the Utah Power & Light Company were guests at the annual banquet of the Boxelder Commercial Club held at Brigham City, Utah, on the evening of Feb. 12. P. M. Parry, commercial manager, and E. L. Bourne, manager of the advertising department of that company, were among the principal speakers.

Mr. Parry spoke of the importance of the power company's new Cutler development on Bear River, to the people of Brigham City and surrounding territory. Work on this project, he stated, will begin early this spring. He also gave an interesting account of the growth and development of the electrical industry during the past forty-five years, and predicted even more remarkable expansion in the future.

Mr. Bourne discussed quite extensively the power company's activities in the territory it serves. He stressed the idea of customer-ownership of its preferred stock, bringing out the fact that practically every person has a certain proprietary interest in the country's public utilities for the reason that he is a depositor in a savings bank or a holder of policies in life or fire insurance companies or both, and that these institutions have invested a considerable amount of money in public utility securities as a safe and profitable investment.

Mr. Bourne described the company's hydroelectric system and its operation, and emphasized the value of its water-storage facilities in providing adequate and dependable service at all times. He also told of some of the new features contemplated for the new Cutler plant. He predicted much increased activity in all lines of business in the Intermountain section, and stated that his company's decision to proceed with the construction of the Cutler plant is based on its confidence in the future of the territory.

Committee Chairmen Named for San Diego Electric Club

The first meeting of the San Diego Electric Club since its annual election was held recently, and committee chairmen for the year were named by the new president, Herbert Rose. These appointments were as follows:

Programs—William Boyce, assisted by W. A. Cyr in charge of program cards and publicity; power company—R. C. Cavell; electric home—Alex Schreiber; army and navy relations—Commander D. C. Webb; street railway—J. A. Moon; telephone company—A. E. Scott; membership—W. C. Wurfel; back country relations—Al May; street lighting—G. H. P. Dellmann; better wiring—W. H. Talbott; relief—C. C. May.

New committees formed, with their chairmen, follow: Inter-city relations, with the special purpose assigned to it of associating the club with the electric interests of the Southwest in any movement of mutual interest—Ralph Zink; inter-club relations, to cooperate with other clubs of the city in movements of mutual import—A. E. Holloway; engineering and technical—L. M. Klauber; public relations—Walter Wurfel; city government relations—A. E. Johnstone. The following chairmen of electrical committees were also appointed: Electrical contractors—J. F. Zweiner; electrical dealers—E. C. Myers; electrical wholesalers—J. F. Munro; electrical manufacturers—T. P. Chase. A committee on sports and outings is headed by C. D. Weiss.

An innovation was introduced by the president in the appointment of "ambassadors" from the club to neighboring cities. The ambassadors and their posts follow: Eddie Ellis, Los Angeles; Joe Lowe, National City; A. R. Whisler, Oceanside; W. E. Lyon, El Cajon; C. P. Whiteman, La Mesa; W. A. Lambert, Coronado; Percy Fisher, Escondido; S. H. Messner, La Jolla; W. W. Gibson, Tiajuana.

Roger Ruffin was named sergeant-at-arms and Austin Adams, the playwright, was chosen as "traveling chaplain."

At the succeeding meeting William Boyce, chairman of the program committee, outlined the program for the year, assigning to each committee and to each ambassador the responsibility for one week's program, a plan similar to the one that worked out successfully during the preceding term.

COMING EVENTS

Commercial National Section, N.E.L.A.—
New York, N. Y.
March 17-19, 1925

Southwestern Public Service Association—
Annual Convention—Rice Hotel, Houston, Texas
May 5-8, 1925

Electrical Supply Jobbers' Association—
Annual Convention—Hot Springs, Va.
June 1-6, 1925

Associated Manufacturers of Electrical Supplies—
Annual Meeting—Hot Springs, Va.
June 8-13, 1925

National Electric Light Association—
Annual Convention—San Francisco, Calif.
June 15-19, 1925

Illuminating Engineers See Automotive Lamp-Testing Equipment.—At a special evening meeting of the San Francisco Bay Cities chapter of the Illuminating Engineering Society, held at the University of California, Berkeley, on Feb. 26, headlight and signal testing for automobiles was discussed by Prof. Llewellyn Boelter of the university. The testing equipment designed by Prof. Boelter was demonstrated, and the history and present status of headlight regulation were discussed. The San Francisco chapter meets regularly at the States Restaurant, San Francisco, every Tuesday at noon.

Directors Elected by Society for Electrical Development.—At the annual meeting of The Society for Electrical Development, held in New York, Feb. 3, four directors, each to serve a four-year term, were officially elected. The men named are: J. F. Gilchrist, to represent central station interests; G. F. Morrison, to represent manufacturing interests; F. D. Van Winkle, to represent jobbing interests; and G. Fred Laube, to represent contractor-dealer interests.

Synchronous Club of Los Angeles Shows Healthy Growth

The 200 membership mark has been passed by the Synchronous Club of Los Angeles, an organization of men associated with the electrical industry in that city. The club was organized Aug. 1, 1915, with an initial membership of thirteen and apparently has been successful in turning the fabled jinx into a booster. According to the constitution of the club, its object is to afford the "commercial and technical betterment of its members through the interchange of ideas and experience and to promote friendship and sociability among the members."

The society meets once a month for dinner, a more or less technical talk and a social evening. Once a year the accumulation of associate members that have been brought up to speed is "synchronized" into full membership. The club's constitution has been recently brought up to 1925 standards and the initiation fee increased from one to five dollars.

Present officers are: F. C. Webber, Southern California Edison Company, president; H. N. Beecher, chief city electrical inspector, vice-president; W. G. Tanner, Southern California Edison Company, secretary; J. R. Tracey, Westinghouse Electric & Manufacturing Company, treasurer; and T. P. Mosso, electrical contractor, sergeant-at-arms.

Entertainment of excellent quality is being provided by the committee in charge, which is composed of J. H. Pengilly, of Brown & Pengilly; Harry Rothwell, electrical contractor; W. O. Farrington, Garlock Packing Company; Frank A. Short, Safety Electric Products Company; R. H. Cates and N. B. Hinson, Southern California Edison Company.

Sacramento Electrical Society Visits Radio Station

Instead of the regular February meeting of the Sacramento Valley Electrical Society the members visited KGO, the radio broadcasting station of the General Electric Company, and the General Electric lamp works and factory in Oakland, Calif. A special car was attached to the regular Sacramento Short Line train for the use of the members. They were met at the station and taken to the General Electric factory in East Oakland. During the noon hour the members inspected KGO where a special program was presented. After this they proceeded to the Edison lamp works where lunch was served in the company's cafeteria. Following a short meeting, the society had an opportunity to go through the lamp works with competent guides.

Vacuum Cleaner Men Meet in Spokane.—Thirty salesmen and officers of The Washington Water Power Company attended a banquet given in Spokane on Feb. 18 by R. B. Carter, manager of the Spokane district office of the Eureka Vacuum Cleaner Company. Mr. Carter told the gathering of the large volume of business done last year by his office and stated that the district made one of the best showings in the country. Other speakers were: R. B. McElroy of The Washington Water Power Company and W. G. Stewart and C. H. Baldwin of the Eureka agency.

Personals

R. N. Phelan, for the past year and a half secretary-treasurer of the Electrical Contractors and Dealers' Association of Sacramento, Calif., has been appointed associate editor of the Journal of Electricity, effective Feb. 15. He takes the place left vacant by **George W. Barker,** who has resigned to become connected with the headquarters sales staff of the Allied Industries, Inc., San Francisco. Mr. Phelan is well known to the electrical industry, his former position with the contractor-dealers' association having kept him in close touch with local activities and particularly with matters of interest to contractors and dealers. He was also prominently identified with the Sacramento Valley Electrical Society, which is composed of men from all branches of the industry, and prior to his departure from Sacramento was elected secretary of that organization. Previous to his connection with the association, he was affiliated with Latourrette-Fical Company, mechanical and electrical contractors. While in their employ he acted as the firm's general representative in the San Joaquin Valley, for the most part superintending mechanical and electrical construction. Mr. Phelan is a graduate of the University of California, from which he received the degree of bachelor of science in electrical engineering.

R. N. PHELAN

Harley P. Wilson, president, Western Power Corporation of New York City, holding company for the Great Western Power Company, San Francisco, and the San Joaquin Light & Power Corporation, Fresno, spent some time in San Francisco recently on business connected with the merger of the latter companies.

Bruno Barth, of the Southern Electrical Company, C. C. Clardy, secretary, Electrical Exchange, and **Charles Stevens** of the Pacific Telephone & Telegraph Company, all of San Diego, were elected first vice-president, second vice-president, and secretary-treasurer, respectively, of the San Diego Electric Club at its recent annual meeting.

N. N. Farr, Farr Electric Company, Salt Lake City, was in San Fransico a short time ago.

E. C. Headrick, Denver, Colo., a former chairman of the advisory committee of the Electrical Cooperative League of that city, has been re-elected the representative of the Mountain division on the executive board of the Association of Electragists, International.

I. Elkas, formerly district sales manager of both the Chicago and St. Louis offices of the Robbins & Myers Company, has been made special representative of the fan sales department of the Wagner Electric Corporation, St. Louis. **L. L. Goding** has been appointed manager of the department.

J. W. Redpath, formerly secretary of the California State Association of Electrical Contractors and Dealers, has joined the sales staff of George A. Gray Company, manufacturers' agents of San Francisco.

Harry B. Sewell, manager at Bellingham, Wash., for the Puget Sound Power & Light Company, Seattle, recently addressed the Kiwanis Club of Bellingham on the Baker River power project now under development by his company.

George W. Wise, former purchasing agent of the Butte Electric Supply Company, Butte, Mont., has announced his determination to enter into business in Seattle and make his permanent home there.

E. P. Schaefer, since 1922 San Joaquin Valley representative of the Wholesale Electric Company, San Francisco, has been made purchasing agent for that company and in the future will be located at the home office, 817 Misison Street.

Franklin Heywood, formerly in the electrical and radio business in Australia and England and more recently in Los Angeles, has been appointed representative in the San Joaquin Valley for the Wholesale Electric Supply Company, San Francisco.

N. W. Averill, of the Electric Storage Battery Company of Los Angeles, was a visitor to San Diego recently, attending the opening meeting of the Electric Club for the year. Other guests from out of town were **John Black,** of the telephone company in Pasadena, **Edgar E. Allen,** of Los Angeles, and **Felix Mezinard,** of the Victor Welding Company, Los Angeles.

L. A. Hobbs, engaged in the lighting fixture business in Los Angeles, made a trip to San Francisco a short while ago.

E. S. Hawkins, prominent journeyman electrician in Denver, is serving as a representative from Denver County in the Colorado legislature and holds a number of prominent committee appointments. He is the sponsor of a standardized lighting code which has the backing of Colorado electrical interests.

C. C. Shaw, Lalley Electric Company, Fresno, Calif., recently paid a visit to San Francisco.

M. M. Boring, General Electric Company, Schenectady, N. Y., was among recent visitors in San Francisco.

F. N. Averill, Fobes Supply Company, Portland, recently visited San Francisco.

George W. Farnham, for a number of years traveling representative of the McGraw-Hill Book Company, Inc., New York, engaged in calling upon college professors, has been made manager of that company's educational department. **Franklin B. Hanley,** formerly instructor in geology, Washington University, St. Louis, succeeds Mr. Farnham.

A. F. Wakefield, for the past two years a vice-president of the Wakefield Brass Company, Vermillion, Ohio, has been promoted to the position of general manager, taking over the bulk of the executive work formerly handled by F. W. Wakefield, president of the company.

Fred Clark, of the New York office of the Western Electric Company, and **L. W. Abbott,** of the company's Chicago branch, recently visited San Francisco.

H. L. Barker, vice-president and general manager, The Meadows Manufacturing Company, Bloomington, Ill., was a recent visitor on the Pacific Coast. During his trip he conferred with various sales representatives of the company.

Henry L. Doherty, president, Doherty Operating Company, New York, was one of those who recently visited San Francisco.

Oliver B. Lyman, manufacturers' agent of San Francisco, recently returned to that city after a trip East. To the lines he already handles he has added those of the Burke Electric Company, Erie, Pa., Burndy Engineering Company, Inc., New York, and the Metropolitan Device Corporation, Brooklyn, N. Y.

Dwight Ware, of the Puget Sound Power & Light Securities Company, Seattle, Wash., has been advanced to the position of manager of that company since the death of Frank Dabney, former manager. This company was organized a few years ago to sell the securities of the Puget Sound Power & Light Company, Seattle. Mr. Ware was born in Boston, Mass., in 1885, and received his education at the Volkmann School in that city. In 1904 he entered the bond business in Boston, remaining until March, 1906, when he went to Seattle, entering the employ of the Seattle Electric Company, one of the predecessors of the Puget Sound Power & Light Company. With the exception of a year and a half spent in the sales department of the Minneapolis General Electric Company, a few years with bond and real estate firms in Seattle, and a year and a half in the Navy during the World War, Mr. Ware has been associated with the Puget Sound Power & Light Company and the Puget Sound Power & Light Securities Company. He began with an accounting position, was promoted into the power sales division and thence to his present post.

DWIGHT WARE

A. G. Wishon, since 1920 vice-president and managing director of the San Joaquin Light & Power Corporation, Fresno, Calif., has been named president of that company. He succeeds Wm. G. Kerckhoff, whose resignation was tendered upon the purchase of the controlling interest in the San Joaquin company by the Western Power Corporation of New York in the early part of this year. Mr. Wishon is a pioneer in the field of hydroelectric development and has been closely associated with the San Joaquin company since its earliest stages. He came to California in 1889, and four years later opened an office in Tulare, engaging in the real estate, fire and life insurance business. The possibilities of power development and transmission interested him intensely, and he planned to erect a power

A. G. WISHON

plant on the Kaweah River to develop energy for pumping water for irrigation. After persistent effort and hard work, the necessary capital was secured, and work on the project began in 1895. However, because of the advancement made in the transmission of electricity, the project was abandoned in 1896 and another started at the site of the present Mt. Whitney No. 1 plant, about 31 miles from Visalia, where more power could be developed at lower cost. After another search for capital and much hard work the new plant was started June 30, 1899, just a short time after the organization of the Mt. Whitney Power Company. Mr. Wishon remained as general manager of this company until 1902 when he became interested in a new power project on the Tule River. In promoting this new development he interested A. C. Balch, Wm. G. Kerckhoff, and other capitalists with the result that the San Joaquin Electric Company, which was in the hands of a receiver, was purchased, and Mr. Wishon became manager. Since that time he has seen the business grow from one power house of 2,000 hp., serving two cities, into the San Joaquin Light & Power Corporation, with a system of fourteen power houses of 185,000 hp. serving 187 cities and towns in ten counties. Mr. Wishon was born at Coppeges Mill, Mo., in 1858, and his education was completed in the Missouri School of Mines at Rolla.

Wm. G. Boyce, of the Philip Mayer Company and chairman of the program committee of the San Diego Electric Club, made a business trip to Los Angeles early in February.

Thomas Duncan, president of the Duncan Meter Company, La Fayette, Ind., while wintering in Los Angeles, recently made a sightseeing tour of San Diego and points south. **Wm. Talbott**, of the meter department, San Diego Consolidated Gas & Electric Company, acted as guide while Mr. Duncan was in San Diego, and **M. P. Barbachano**, president of the Lower California Light & Power Company, served in that capacity on the other side of the border.

C. A. Russell, formerly with the Pacific Gas and Electric Company, San Francisco, has resigned to become district manager of the Edward J. Power Company, electric heating specialists of that city. His offices are in the Building Materials Exhibit.

P. Harry Byrne, formerly manager of the electrical department of the Larsen Heating, Plumbing & Electrical Company, Denver, has organized the Byrne Electric Company with temporary headquarters at 965 Madison Street. The business for the present will be limited to contracting. The Larsen company has discontinued its electric department.

W. C. Brown, of the engineering department of the National Lamp Works, Nela Park, Cleveland, recently spoke in San Francisco before the San Francisco Bay Cities chapter of the Illuminating Engineering Society on "Automotive Lighting."

U. G. Trowbridge, electrical engineer, formerly with the Bureau of Power & Light, Los Angeles, has joined the organization of the Southern Electrical Company in San Diego, as head of the motor sales department.

Ernest McCleary, of the McCleary-Harmon Company, Detroit, Mich., formerly president of the National Association of Electrical Contractors and in direct service with that association until 1916, has been elected executive committeeman of the Association of Electragists from the Great Lakes division. Mr. McCleary, accompanied by Mrs. McCleary, while on a pleasure tour of the country, recently visited San Francisco.

C. D. Weiss, superintendent of shops, stores and transportation for the San Diego Consolidated Gas & Electric Company, recently attended the purchasing and stores committee meeting in Fresno as representative of the southern company.

A. W. Leonard, president, and **H. J. Gille**, general sales manager, of the Puget Sound Power & Light Company, Seattle, recently made a business trip to San Francisco.

Leo J. O'Brien, formerly range salesman for the Pacific Gas and Electric Company, San Francisco, has become affiliated with the Great Western Power Company of that city in the same capacity.

W. G. Vincent, vice-president and executive engineer, Pacific Gas and Electric Company, San Francisco, recently spent some time in New York in conference with officials of the National Electric Light Association on matters relating to that organziation.

F. R. Kohnstamm, manager appliance sales, Westinghouse Electric & Manufacturing Company, Mansfield, Ohio, is making a circuit of the company's district offices. He recently spoke in San Francisco before the salesmen of the Westinghouse Company and Fobes Supply Company in that city.

W. D'Arcy Ryan, director of illumination, General Electric Company, Schenectady, N. Y., recently delivered in Seattle an address, illustrated by colored lantern slides, in which he traced the history of illumination from its earliest period to the present time. The occasion was a pre-view of the lighting effects to be used during the coming Knights Templar conclave in that city.

R. D. Evans, general engineer, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., specialist on transmission and inductive coordination between power and communication circuits, recently visited San Francisco and Los Angeles. He was accompanied by **O. B. French**, of the engineering department at East Pittsburgh, a specialist on the oscillograph.

G. A. Sawin, assistant manager of the supply department, Westinghouse Electric & Manufacturing Company, East Pittsburgh, was recently in the Pacific Northwest on an inspection tour of the company's territory.

Obituary

George W. Bixler, manager of the publicity department of the Public Service Company of Colorado, Denver, died suddenly Feb. 20, about a week after the performance of a major operation from which it was thought he was recovering. He has been in the service of the Denver central station since his entry into the commercial department in 1905; later he was transferred to the adjusting department. For some time he was engaged actively in public relations work. Mr. Bixler was a former secretary of the electrical bureau of the Denver Civic and Commercial

GEORGE W. BIXLER

Association and a former director of the advertising bureau of that organization. He was a member of the Rocky Mountain Committee on Public Utility Information and was serving as president of the Denver Advertising Club at the time of his death. He was a native of Illinois.

Robert McF. Doble, a hydroelectric engineer formerly prominent in Denver, died in San Francisco, Feb. 14.

TRADE NOTES

The Connecticut Electric Manufacturing Company, Bridgeport, Conn., manufacturer of wiring devices, has issued recently a pamphlet in five colors illustrating its new line of Connecticut-Bakelite wiring devices.

The Electric Controller & Manufacing Company, Cleveland, Ohio, has published Bulletin No. 1047, describing the EC&M high-voltage automatic compensator for 2,300-volt squirrel cage a.c. motors. This compensator provides complete safety for the operator as well as for the electrical equipment, it is claimed.

The Baker Manufacturing Company, Portland, in competition with fixture manufacturers of the East and Pacific Coast, has been awarded the contract for furnishing the lighting fixtures for the new Hotel Winthrop, Tacoma, Wash. The contract provides for 1,700 lighting fixtures amounting to approximately $30,000, exclusive of lamps.

Worthington Pump and Machinery Corporation, New York, has announced the publication of Bulletin W-607, "Worthington Centrifugal Pumps Serving Every Industry."

The Roger Electric Fixture Company, recently incorporated, has opened sales and display rooms at 4354 Moneta Avenue, Los Angeles. The concern specializes in the manufacture and distribution of electrical fixtures. V. C. Mitton is general manager.

Brown & Pengilly, Inc., Los Angeles, electrical engineers and manufacturers of panel boards, power switchboards, safety switches and like equipment, has announced the appointment of C. H. Talmage, formerly manager of the Western Electric Company, Salt Lake City, as sales manager.

The C. C. Langevin Company has recently been formed by C. C. Langevin, formerly with the Atlantic Pacific Agencies Corporation, San Francisco. The concern, which is the exclusive Pacific Coast representative of the General Radio Company, Cambridge, Mass., has opened offices in the Monadnock Building, San Francisco, Terminal Sales Building, Seattle, and Calo Building, Los Angeles.

The Pan-American Union Trading Company, Ltd., jobber-dealer in electrical and radio equipment, has removed from 918 South Vermont Avenue, Los Angeles, to more spacious quarters at 762 South Vermont Avenue.

Curtis Lighting of California, Inc., is the name of a new lighting company recently incorporated by Curtis Lighting, Inc., Chicago, in order to enlarge and further facilitate operations in the States of California, Utah, Nevada and Arizona. Offices are located at 3113 West Sixth Street, Los Angeles, and officers of the new company are A. D. Curtis, president; Fred S. Mills, vice-president, and F. E. Hastings, treasurer.

The F. W. Wakefield Brass Company, Vermilion, Ohio, has announced the completion of its new factory building which replaces the one destroyed by fire Dec. 4 last. The new unit is 60x160 ft., one story, standard concrete and steel construction.

Birkel & Le Gassick Company, electrical jobbers, 765 Santa Monica Boulevard, Santa Monica, Calif., has purchased a 100x150-ft. lot in the industrial district of that city and started the erection of a 50x120-ft. warehouse and sales room.

Ne Page, McKenny Company, Armour Building, Seattle, on a bid of $25,938, received the contract for cluster lighting system on East and North 45th Streets, Seattle. This was the lowest of six bids submitted.

J. G. Pomeroy Company of Los Angeles has opened a branch office and warehouse at 51 Federal Street, San Francisco, with Grover A. Anderson, formerly sales manager of the Electric Appliance Company, in charge. Complete stocks of all lines represented will be carried to accommodate the demands of the territory. The concern represents the following factories: Rome Wire Company, Rome, N. Y.; M. B. Austin Company, Chicago; Edwards & Company, New York; McGill Manufacturing Company, Valparaiso, Ind.; American Tube & Pipe Bending Company, Cleveland; Federal Porcelain Company, Carey, Ind., and Columbia Metal Box Company, New York.

The Arrow Electric Company, Hartfard, Conn., has announced a new Arrow product, a shallow canopy switch, some of the advantages of which are: Bakelite base only 5/16 in. deep, ratchet handle that cannot vibrate loose or become lost, and Glo-tip added that makes device luminous. The switch can be installed without removal of the handle.

The American Resistor Company, Milwaukee, has announced the opening of the following branch offices: American Resistor Company, 46 Dey Street, New York; 917 Packard Building, Philadelphia, and 802 Title Insurance Building, Los Angeles; British Resistor Company, Aintree, Liverpool, England; Kummler & Matter, Aarau, Switzerland.

The Condit Electrical Manufacturing Company, South Boston, has recently issued the following bulletins: No. 458, "Switch Houses for Indoor and Outdoor Service;" No. 456-2, "Electrically-Operated Mechanism for Automatic Closing and Reclosing of Oil Switches and Circuit Breakers;" No. 423-3, "Type Y Line Oil Switches and Circuit Breakers."

The Federal Porcelain Company, Carey, Ohio, has recently issued a condensed catalog, which contains complete statistical data, including list prices, weights, barrel quantities, dimensions, wire-carrying capacities, and similar information on all items of standard porcelain most commonly in demand. This information is compressed into the space of a four-page folder, 10 x 8½ in. in size, properly punched to fit standard E.S.J.A. salesmen's binders.

The Signal Electric Manufacturing Company, Menominee, Mich., has recently acquired the Marinette Electric Corporation, Marinette, Wis., which manufactures radiophone headsets. The latter company will continue to operate under its own name, but officers of the former company will direct both organizations.

The Hisey-Wolf Machine Company, Cincinnati, has recently issued Bulletin No. 1582 describing four new types of motor-driven combination grinding and buffing machines, all regularly made for alternating and direct current. The bulletin will be mailed to the trade upon request.

The Reliable Electric Company, 2720 Larimer Street, Denver, has moved to 1532 Hooker Street in that city.

This serious group (on the two edges) depicts, not the Three Fates, but rather "Bill" Talbott and M. P. Barbachano bearing up under the great responsibility of guiding Thomas Duncan, president of the Duncan Meter Company, on a sightseeing tour of "quaint old Mexico." "Bill" Talbott, superintendent of the electric meter department of the San Diego Consolidated Gas & Electric Company, shows characteristic sang froid in the responsibilities of entertainment. M. P. Barbachano, who is the monarch of all he surveys in Baja California as president and general manager of the Lower California Light & Power Company, also seems at home with the Foreign Club as a background.

A McGraw-Hill Publication
San Francisco, Calif.

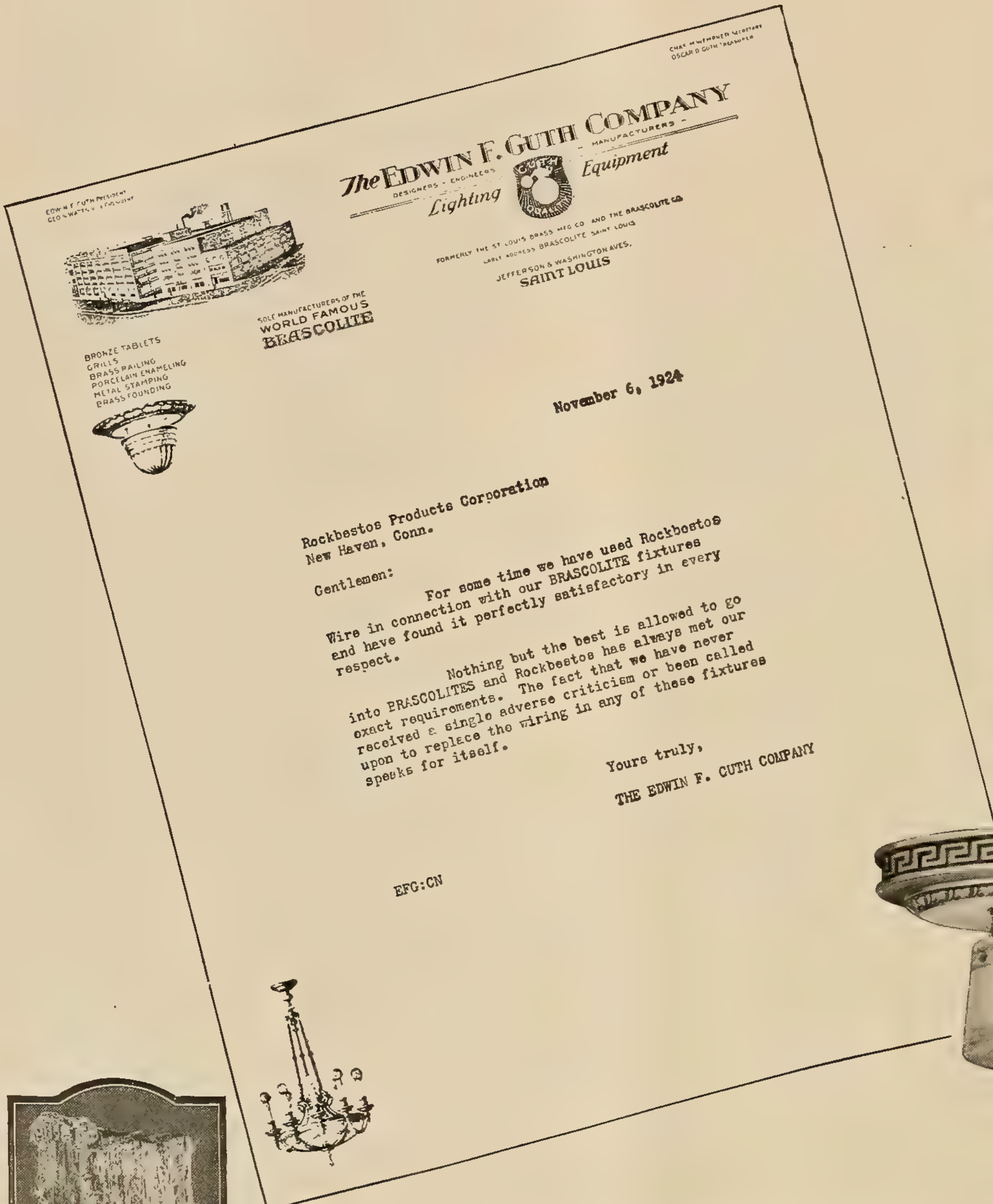
March 15, 1925
25 Cents

Journal of Electricity

Devoted to the Economic Production and Commerc... of Electricity
IN THE ELEVEN WESTERN...

ROCKBESTOS

—the asbestos covered wire



The EDWIN F. GUTH COMPANY
DESIGNERS - ENGINEERS - MANUFACTURERS -
Lighting Equipment
FORMERLY THE ST LOUIS BRASS MFG CO AND THE BRASCOLITE CO.
CABLE ADDRESS BRASCOLITE SAINT LOUIS
JEFFERSON & WASHINGTON AVES.
SAINT LOUIS

SOLE MANUFACTURERS OF THE WORLD FAMOUS BRASCOLITE

BRONZE TABLETS
GRILLS
BRASS RAILING
PORCELAIN ENAMELING
METAL STAMPING
BRASS FOUNDING

November 6, 1924

Rockbestos Products Corporation
New Haven, Conn.

Gentlemen:

For some time we have used Rockbestos Wire in connection with our BRASCOLITE fixtures and have found it perfectly satisfactory in every respect.

Nothing but the best is allowed to go into BRASCOLITES and Rockbestos has always met our exact requirements. The fact that we have never received a single adverse criticism or been called upon to replace the wiring in any of these fixtures speaks for itself.

Yours truly,

THE EDWIN F. GUTH COMPANY

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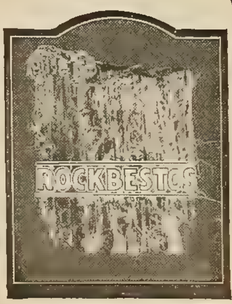

We cannot add another word to the letter—but we can say, we are always at your service.

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IN THE ELEVEN WESTERN STATES

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G. R. HENNINGER, Associate Editor

R. N. PHELAN, Associate Editor
B. H. SNOW, Northwest Editor

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How Shall We Gage Our Usefulness?

AN actor, a speaker or a musician can tell whether he is making an impression upon his audience by the amount of applause he receives. If his lines are funny or his speech stirs his auditors or his music is inspiring, he is immediately aware of the fact. With the editors of a paper like the Journal of Electricity it is entirely different. They are speaking to a scattered audience, never assembled in a group. The material appearing in the book seldom can be witty or inspirational. It deals largely with hard business facts or important news. Consequently there are few barometers by which the editors can gage the effect the magazine is having on its readers. Occasionally, however, letters are received in which a reader definitely gives his impression of the magazine. The following are typical of a number which have been received recently.

"I consider the Journal of Electricity the outstanding trade journal of the country for those whose interests parallel mine."
Manager, Power Sales Department.

"I consider the Journal a necessity for men in our business who wish to keep abreast of the development and in touch with the local situation."
Vice-pres. & Asst. Gen. Mgr.

"I have the Journal of Electricity purposely sent to my home in order that I may find time to read it, and it is the only electrical magazine that I consistently read."
President.

"The Journal is doing a useful work in its field and I believe it is much appreciated and is received with hearty enthusiasm by those engaged in the utility game."
Vice-President in Charge of Engineering.

Are You Getting Your Share Of This Business?

The growing industrial plant is a steady buyer of electrical supplies whose business every electrical dealer should try for. One sure way to make the industrial plant a satisfied customer is for you to recommend and install equipment that will give troubleproof service under the hardest conditions of service.

DURACORD

Reg. U. S. Pat. Off.

is a tough, long wearing cord that is ideal for industrial work. It has a rugged cover which resists jerks and strains, and prevents the copper stretching and breaking. This cover is also impregnated to resist water, oil and abrasion—the three evils which most frequently cause the breakdown of portable cord in industrial plants.

DURACORD is made in all standard sizes ranging from the largest size required for a magnetic crane to the smaller sizes used on extension lamps. You can therefore secure DURACORD to fill every cord requirement of your industrial customers.

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EDITORIAL

President Coolidge Reiterates Stand Against Government Ownership

THERE can be no doubt as to the attitude of the administration toward government ownership and operation of public utilities. The platform upon which President Coolidge was swept into office was clear enough on this point. Now comes the inaugural address on March 4 last, in which the president said, "There was a manifestation of such faith in the integrity of the courts that we can consider that issue rejected for some time to come. **Likewise, the policy of public ownership of railroads and certain electric utilities met with unmistakable defeat.** The people declared that they wanted * * * independence and freedom continued and supported by having the ownership and control of their property, not in the government but in their own hands."

It is not surprising, therefore, that industrial America is responding to the encouragement conveyed by such assurances by inaugurating developments and improvements that promise to establish new records. The idea of offering to promote the material welfare of the people by killing the initiative that creates opportunity for the people seems to have failed to register with the majority, for which may we be truly thankful. The sound underlying common sense of the majority of the American people may be relied upon with a certain confidence, if they are informed as to the facts of the issues involved. The real problem lies in informing the people.

Appliances That Lie On the Shelf, Tra-La, Have Something to Do With the Case

JUST for the fun of it, someone ought to take the time to make a thorough survey of the homes within a supposedly electrified area, the sole objective of that survey to find out:

"How many electrical appliances are there on closet shelves or in the attic of so-called electrified homes—that is, homes wired for electricity? and

"Why are they there?"

As in all good O. Henry stories, the "kick" is in the last line. "Why are they there?" Indeed, yes.

Is it because the home has no convenience outlets, and that the appliance,—by the time a globe is screwed out of its socket, a double plug screwed in, amid encircling glassware—is really an electrical inconvenience? Then the remedy is to be sought in making electricity painlessly accessible, through modern wiring.

Is it because consumption of electricity is feared, lest the bill be too high? Then it is convenience and cleanliness that must be sold.

Is it because the appliance has been over-rated to the customer and, having been "stung," as he thinks, he does not want to use it? Then his misapprehension must be allayed and his confidence slowly built up to par.

It may be because the housewife is a creature of habit, old-fashioned, one who just will not adjust herself to the use of the labor-saving device, preferring to use the methods of her grandmother. Her case is almost, but not quite, hopeless. She is a hard and unyielding customer, but persistence in the demonstration of its usefulness may win her in the end.

Or is it that most subtle of reasons, the hardest to discover and the simplest to remedy? Something has gone wrong with the appliance. Maybe the insulation on the cord has worn out, something as simple as that. The cord shorted and blew a fuse. In fear, the housewife, feeling that she has somehow done something wrong, calls the power company, vaguely saying that the lights have gone out. Meanwhile she has stowed the offending appliance on the closet shelf or up in the attic lest the trouble-man discover it when he arrives, and blame the trouble on that particular iron or percolator. Maybe she has had a previous experience with a gruff chap who made a remark something like this, "Were you using that thing? No wonder she blew."

Anyway the appliance has gone on the shelf, and it will probably stay there for several weeks, or months, before she will venture, furtively, to bring it out again and hook it up to the line. All that time the appliance is a dead loss to the central station.

The matter of servicing appliances is a delicate one. It is ground that a suggester treads upon lightly. But as long as the appliance lies on the shelf unused for want of intelligent and courteous servicing, it might as well never have been sold. It is a potential source of revenue that has been hidden away. Moreover, it is pretty apt to be an influence which makes that housewife timid about buying any new or different type current-consuming device—another potential source of revenue dammed up.

The appliance that lies on the shelf, tra-la, is an important point in the case. The sale of an appliance is not complete when it is merely put on the line. It must be kept on that line to be really sold.

Another Congressional Excursion to the Colorado River

NEWS comes from Washington that another august body of United States senators and representatives shortly will visit Arizona for the express purpose of viewing the Colorado River and investigating the various phases of that stream with reference to the government's participation in its development. This time investigation of the all-American canal and the Boulder Canyon dam are excuses for a junketing trip.

What the people of the West desire with reference to the Colorado River are not excursions nor investigations. They want action; action by the states concerned with the Colorado River compact; action by Congress on some of the legislative phases of the problem.

Any number of investigations, surveys and studies of the river in all its phases have been made during the past decade. Many parties of Congressmen have visited the river and been impressed by its latent power. Sufficient data are available to furnish any Congressional committee with all the information it could possibly need in formulating plans or reaching a decision, without making a trip from Washington for a glimpse of the Grand Canyon. But then the present bill against the river for junketing trips, investigations and surveys is probably so large that a few thousand dollars for another Congressional excursion will not add much to the total.

Life in a California Construction Camp

"TO see ourselves as others see us" is usually amusing, and to those in search of mental relaxation we commend at least one article of a series by T. B. Ross in our English contemporary, "The Electrical Review," which deals mainly with living conditions at the Big Creek construction camps of the Southern California Edison Company, as viewed through foreign eyes. Our guest from overseas describes the details with such minuteness that no difficulty is experienced in picturing the scene. British society distinctions were completely ignored. "There is no distinction of class when taking one's seat at table," Mr. Ross remarks with peeved indignation. He adds that "Americans are, I should say, the fastest eaters in the world. I and some of my own camp pals from home had often only just started a meal when the 'roughnecks' were leaving their seats after a hearty and full meal." Yes; not only fast eaters but fast workers, too; otherwise our critic would have gone elsewhere for data on "The World's Largest Engineering Project."

Mr. Ross might have realized that when in a foreign country he should make an attempt to learn whatever local peculiarities of language are current. It is distressing to be reminded, of course, that English-speaking people in various parts of the world (in various parts of England, too, it may be added) use different words to denote the same object. Mr. Ross asked his neighbor "to please pass the porridge," and was hurt at the inaction that followed his request. Luckily there was present someone of broader linguistic attainments, who added a translation: "Pass 'English' the mush."

Few visiting Englishmen, in criticizing Americans, are fair enough to temper judgment with a thought as to what would happen to a foreigner in England who insisted on disregarding local word usage. Imagine the reception that would be accorded an American in an English construction camp who insisted on referring to "porridge" as "mush." In this connection Mr. Ross comments on Big Creek table etiquette as follows: "From the fall of the flag until the finish, the average American workman never stops, and his methods of manipulation are in some cases somewhat rough and ready. . . . If you expect to eat anything you must forget your British table etiquette and manners. . . ." Note the fact that Mr. Ross compares the "upper" or "middle" classes in the old country with the workmen of America. This is illogical, unfair and a snobbish interpretation. We happen to have seen the table performances of Cornish laborers, Devonshire farmers, Welsh miners, cockneys and various other types of the genus workman in the British Isles; and it was evident that ample leisure had not resulted in the development of any fine sense of etiquette or delicacy of manipulation. The mistake made by Mr. Ross was in maintaining too close and reserved an association with his "camp pals from home." America is a fine country, but the judgment of foreigners will remain warped so long as an aloofness is maintained, based on an imported absurdity of social distinction and an illogical method of comparing the peoples of the two great English-speaking nations.

Where Do We Go from Here?

NEWARK, Calif., is one of the large distributing points for power brought from the Sierra Nevada to the San Francisco industrial region. Three tower lines lead into the substation. Wires from two are connected to the switching structure. Cable reels from the third, the City of San Francisco's ninety-mile Hetch Hetchy line from Moccasin power house, lie on the ground a few hundred yards distant. A suggested title for the picture thus presented to a casual spectator might be "Where do we go from here?"

On April 1, 1925, or shortly thereafter, there will be available at this point 80,000 kw. of electrical energy, representing, in round numbers, approximately 360,000,000 kw-hr. annually at 65 per cent load factor. And in the meantime politicians in San Francisco are raising a hue and cry regarding the disposal of this block of power, befuddling the public mind with their wild proposals and getting nowhere.

The latest suggestion from the San Francisco supervisors is that the city advertise for bids for power in any size blocks at any point on its ninety-mile transmission line, provided the bidder is a municipality, a water district or an irrigation district. Nowhere north of Los Angeles is there a municipality large enough or with a municipally

owned distributing system which could handle such a block of power. The one irrigation district which might conceivably use a fair sized block of power already owns a generating station and is wholesaling a considerable surplus of its power to a private company. The folly of this latest suggestion is apparent.

Disposal of Hetch Hetchy power through the existing privately owned systems in San Francisco, under an agency agreement, purely temporary in character and restricted to the interim until, and if, the city acquires its own distributing facilities has been declared legal by the solicitor of the U. S. Department of the Interior. Such a procedure is heartily endorsed by the Chamber of Commerce and other civic bodies.

Until the Railroad Commission can complete its valuation of the systems of the privately owned companies already serving San Francisco, which will not be until March, 1926, and until the people of San Francisco vote on the question of whether or not they desire to embark upon so hazardous an undertaking as the distribution and sale of electric energy, the city would be wise to dispose of its power by the legal means suggested above. If it fails to do so, the taxpayers will lose a sum variously estimated at $2,000,000 annually. And as a closing thought for the consideration of the supervisors, we call attention to the defeat since 1918 of four proposals by the people to increase the debt limit of the city and of three proposals since 1910 to buy the system of the Spring Valley Water Company. We seriously doubt that the people ever will vote to follow in the footsteps of Seattle, Detroit and Los Angeles in their municipal enterprises.

DISCUSSION

Suggestion Made That Portable Motors Be Used for Orchard Spraying

To the Editor:

Sir—I notice on page 129 of the Feb. 15, 1925, issue of the Journal of Electricity an article regarding orchard spraying and the need for the development of electric motors to handle this business.

I am wondering if it would be possible to use small spray motors developed particularly for this purpose. In other words, would it be cheaper to run cables through the orchard and handle the spraying of the individual trees from a tank using either compressed air or small portable blowers rather than piping the mixture to hydrants throughout the orchard?

Very probably some manufacturers could develop this type of equipment if you think this idea feasible.

H. S. VAILE.

Chicago, Ill.
Feb. 26, 1925.

Electro-Thermo-Zoologist Required to Answer Questions Raised by Engineer

To the Editor:

Sir—The attached clipping for an A.P. grapevine release is going the rounds of the press. We all know the menace cats are to substations and electric equipment, but some interesting questions might be put to the electrical people.

How many B.t.u. per pound is contained in a cat?

What is the maximum flame temperature from cat fuel?

Do its nine lives have a greater flame temperature or greater B.t.u. value than if it had but one?

CAT SWISHES TAIL AND LO, POWER QUITS

But Poor Pussy Gives Up All of Her Nine Lives to Cut Off City's Lights

KNOXVILLE, IA., Feb. 21.—The light and power service of four Marion county cities was cut off, a big coal mine was forced to shut down and thousands of electric washing machines, percolators, toasters, stoves and curling irons were rendered useless for three hours as the result of a misguided swish of a curious cat's tail today.

Not being satisfied with the view from back fences, the old cat climbed a telephone pole six miles north of Knoxville. While standing with its forefeet on a copper wire carrying 44,000 volts it carelessly moved its tail, which came in contact with the ground wire. Thomas' nine lives went up in smoke. The wire was melted by the intense heat and the entire transmission system of the Marion County Electric Company was cut off.

While a repair crew worked for three hours to fix the damage, the cities of Knoxville, Pleasantville, Melcher and Dalas were without electric power and the Consolidated Indiana Coal Company's big mine was shut down.

Which of its nine lives has the greatest thermal value?

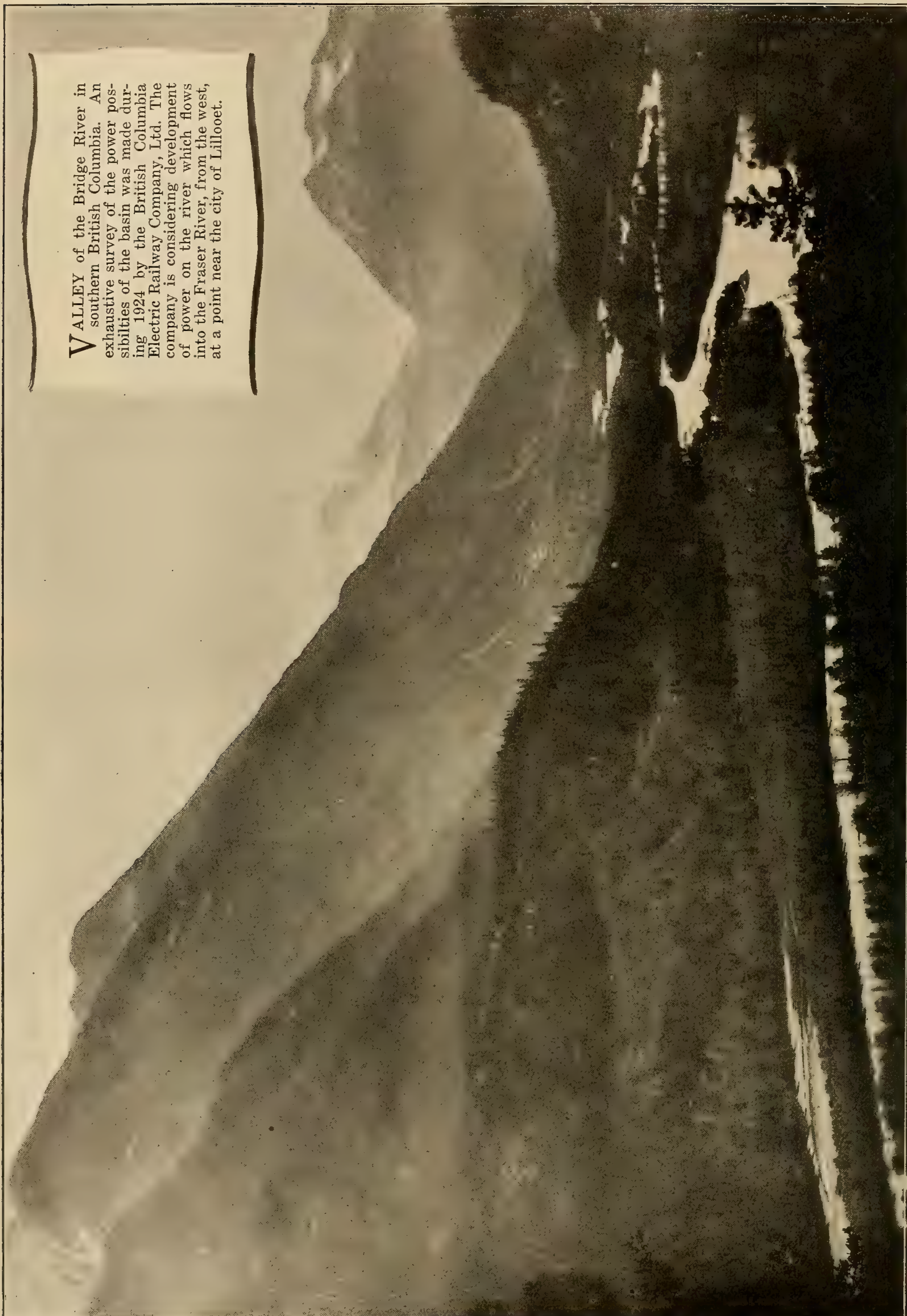
In consuming a nine-life cat is the oxygen requirement for combustion greater or less than other fuels?

Is complete combustion necessary for its maximum heat value?

It looks like you might get a number of electro-cat-thermal-metallurgical questions before the people in emphasizing the cat menace. Why not have a "cat catcher" on the job?

LETSON BALLIET.

Tonopah, Nev.,
Feb. 23, 1925.



VALLEY of the Bridge River in southern British Columbia. An exhaustive survey of the power possibilties of the basin was made during 1924 by the British Columbia Electric Railway Company, Ltd. The company is considering development of power on the river which flows into the Fraser River, from the west, at a point near the city of Lillooet.

Electrical Features of the New Long Beach Steam Plant

By G. A. Fleming* and E. R. Stauffacher†
Southern California Edison Company, Los Angeles

LONG BEACH No. 2 plant of the Southern California Edison Company, with an installed capacity of 70,000 kw., is the largest steam generating plant west of the Mississippi. Designed and constructed by Stone & Webster, Inc., it includes many new and unique features in steam-plant practice. Some of these are described in this article.

THE completion of Long Beach Steam Plant No. 2 in January added 70,000 kw. to the generating capacity of the Southern California Edison Company. This brings the generating capacity of the system to 465,000 kw., 40 per cent of which now is derived from steam and 60 per cent from hydroelectric power.

The units of the new station are two 35,000-kw. General Electric Curtis turbo-generators, the largest of any west of the Mississippi. A new building has been erected adjacent to but separate from the older plant now known as Long Beach No. 1. The old plant is approximately equal in capacity to the new plant but contains six units. A study of these two stations will show the remarkable development in steam plant design that has taken place since Plant No. 1 was constructed, a period of only fifteen years. The old plant when built was noted for its high operating efficiency.

This development is perhaps most noticeable in the steam equipment which results in a 40 per cent saving in fuel and a consequent large saving in dollars to each consumer. But changes in the method of handling and controlling the electric power are also extensive. The electric art has developed so rapidly that it was desirable and economical to combine the control of both plants on a single new switchboard and to gather the power from the two stations on a common and modern bus structure before transmission to the distributing points.

There were several reasons for the selection of the Long Beach site:

1. Industrial growth in the past few years to the south of Los Angeles and in and about Long Beach has shifted the system load center so that Long Beach is a logical location as regards the system load requirements.
2. The Long Beach site is located on the ocean front so that it is a comparatively simple matter to make use of sea water for condenser cooling.
3. The company owned vacant land adjacent to its No. 1 plant and by acquiring a small additional area a considerable saving in real estate was made.
4. By having two plants so close together considerable saving in operating expense could be realized.

By nature of the wide departure in the design of generators, boilers, and switching equipment it was deemed advisable to make the new plant an entirely separate installation instead of an extension to the old plant; the turbines and generators being of much larger capacity and horizontal type would not fit into the building which was designed for the old vertical machines. Also the boilers are very much larger and carry higher steam pressures which made their connection to the old steam system entirely out of the question; hence their separate and independent installation. The concentration of so large an amount of power made it necessary to replace all of the outgoing 60,000-volt line switching equipment with oil circuit breakers of larger interrupting capacity. It was therefore decided to build a complete new switchhouse to acommodate the four present 60-kv. feeders, as well as four new circuits.

Stone & Webster, Inc., of Boston were the engineers in charge of design and construction and fully maintained their reputation of speed and ability to meet a set date for operation.

The general layout and the electric connections are well illustrated in the accompanying diagrams. The simplicity of the main power circuits is evidenced by comparison with the auxiliary equipment. Power is generated at 11-kv. and stepped up to 66 kv. through unit transformer banks without the use of any primary bus or switches. Elimination of these expensive and massive structures is possible with modern high-tension circuit breakers which assure proper action for both automatic and synchronizing operations. The high inherent reactance of the transformers prevents excessive current passing to or from the generator circuits in case of insulation failure. The careful design and rigid construction of the generators, transformers and oil circuit breakers guarantee against their destruction with even the most severe system troubles. The circuit breakers are rated at 1,200,000-kva. interrupting capacity. This rating represents the largest circuit breakers built up to this time for this class of service. These breakers, however, will be stressed approximately to their full rating when clearing severe system short circuits.

To insure continuity of service at all times, the need for maintenance has been reduced to a minimum by the station and equipment design which is such that the necessary maintenance work is readily handled. The generator conductors are doubly insulated by the use of cable covering and by porcelain supports, and are so located that all sections are ac-

*Electrical Designer
†Protection Engineer.

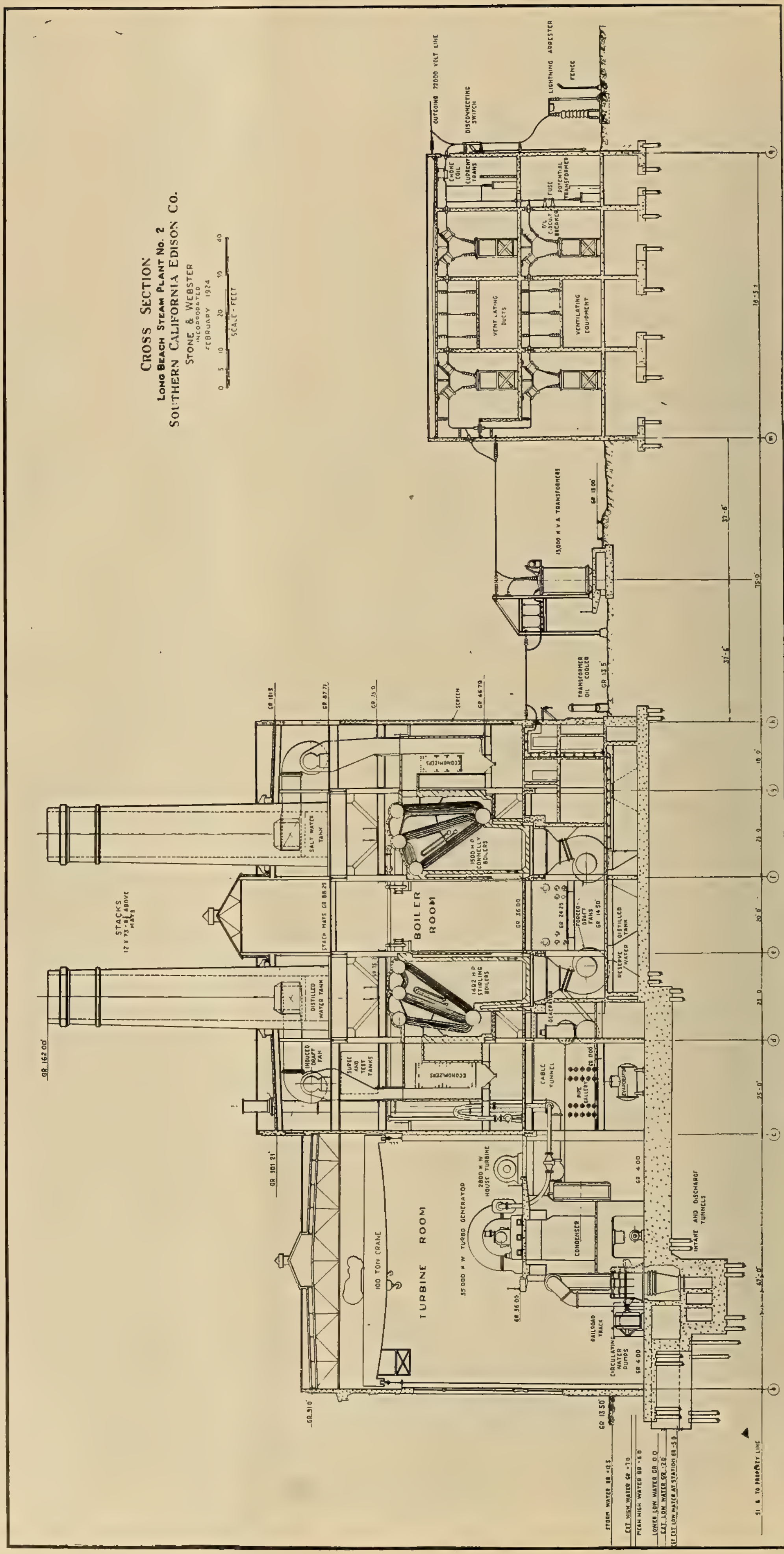
cessible. The 66,000-volt equipment is in duplicate, thus allowing regular inspection and maintenance of all parts. The placing of this high-voltage equipment indoors may seem to differ from late practice, but it was considered advisable due to the location of the plant right on the ocean front. To prevent the spread of possible fire from the oil-filled circuit breakers, they are placed in separate rooms with oil curbs and fire doors. Remotely controlled fire extinguishers are installed for fighting oil fires in the switch rooms.

The generators are entirely closed machines. The air in the housing is cooled by water coils or radiators located in the generator pit, the coils being cooled by circulating sea water through them. The windings within the machines are thus free from dust, and clean air is circulated through them at all times. This should add materially to the life of insulation and windings. A further advantage in the closed system is the effective and easy means of smothering fire occurring within the generator housing.

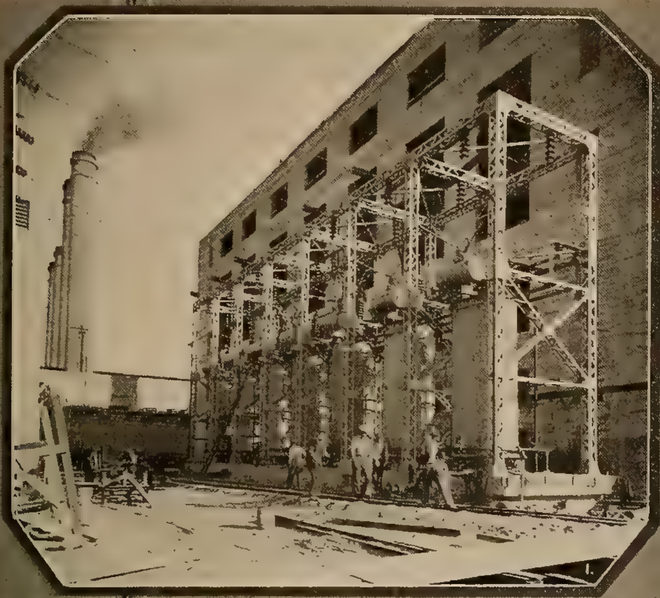
The main transformers are General Electric Company forced oil-cooled, with three 13,000-kva. single-phase units in each bank. A spare is located between the two banks in such manner that it readily can be connected in place of any one of the other six.

To assure the circulation of oil at all times, an elaborate system of pumps has been installed that provides for automatically bringing in a spare pump should any one pump fail to operate properly.

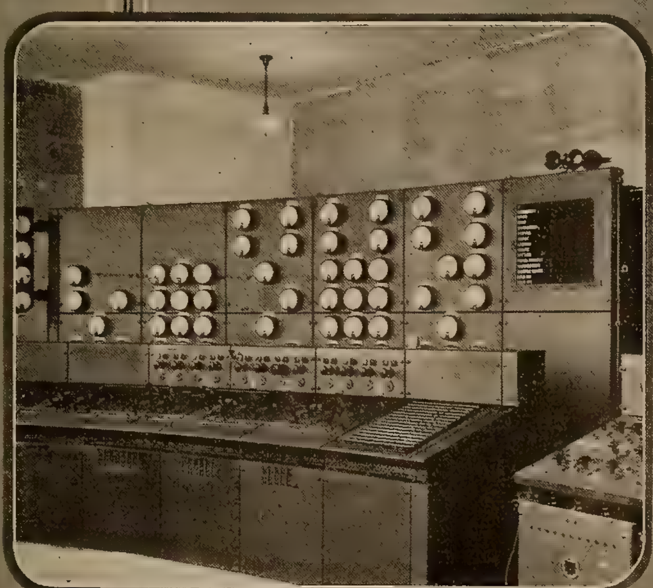
The power required for auxiliary pumps and equipment in a modern steam plant is so extensive and diversified that its control is more complex than that

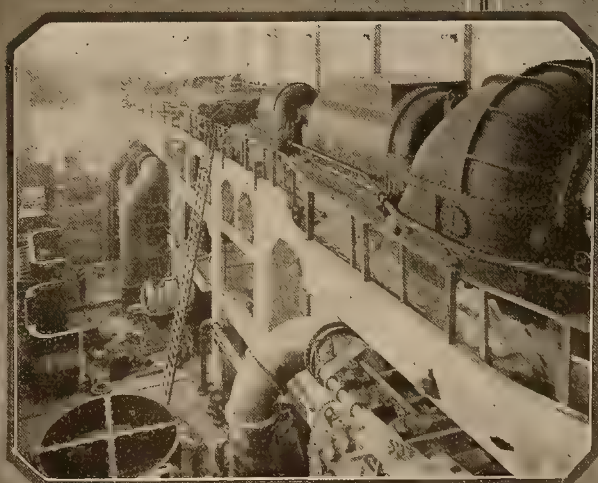


Cross section of the Long Beach No. 2 steam plant of the Southern California Edison Company. With an installed capacity of 70,000 kw. in two units, this is the largest steam station west of the Mississippi.

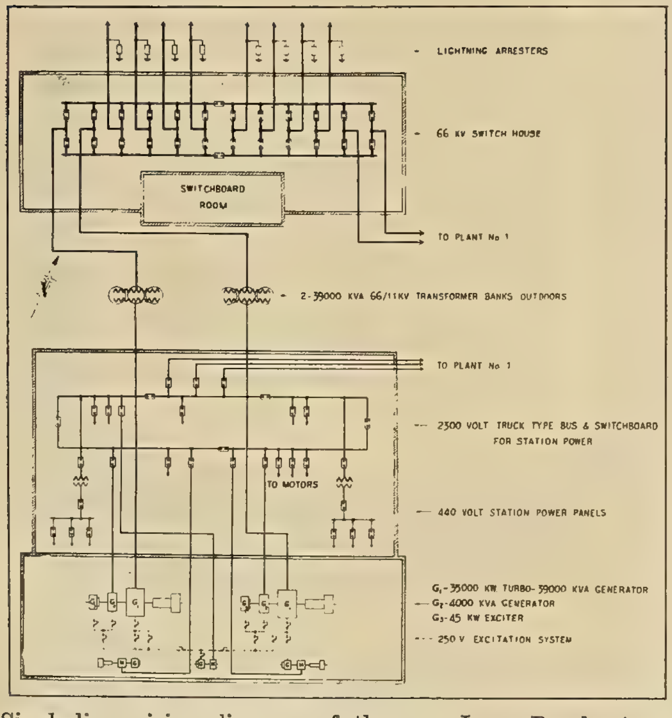


MODERN steam plant practice is embodied in every detail of the new Long Beach plant of the Southern California Edison Company at Long Beach, Calif., as shown in the accompanying illustrations. No. 1 shows the 66-kv. transformers between the plant and the switchhouse. No. 2 is a general view of the new station with the old Long Beach plant at the left. No. 3 shows the assembly of truck-type switch panels controlling the various motor circuits in the station. Induction-type relays are mounted on the bottom of the panels below the handles of the manually operated circuit-breakers. No. 4 is a view of the switchboard. Power from both stations is handled from one board. The visual annunciator system is shown on the right end of the switchboard. No. 5 shows the interior of the station.





of the main power circuits. This station is provided with two 2,300-volt, 4,000-kva generators that serve all auxiliaries. These house generators are mounted on the shaft common to their respective main units and feed a truck type bus and switch assembly which, with its connections, forms in itself a respectable little power system. Here again care has been taken to guard against interruption of service by arranging the 2,300-volt bus as a complete ring divided by circuit breakers into five sections. The two house generators, together with three circuits which can deliver power from station No. 1, are arranged in these sections in such a way as to minimize interference with service regardless of the type or location of trouble. The house generator circuit breakers and the complete control of the house generators are handled electrically from the main switchboard. All motors of 50 hp. and over are served at 2,300 volts either on separate circuits from the station bus or in carefully selected groups. All motors in the station, excepting one 500-hp. unit, are of the full-voltage-starting type of induction motor, and are individually controlled by push buttons and magnetic contactors. These motors are mainly of single and double squirrel-cage construction, but where variable speed is necessary wound-rotor and brush-shifting motors are used.



Single-line wiring diagram of the new Long Beach steam plant and switchhouse

Power for motors of less than 50 hp. is supplied from the 2,300-volt bus through two banks of 2,300/440-volt transformers. These banks each feed a bus and a dead front switchboard assembly of hand-operated automatic trip oil circuit breakers which divide the circuits for the smaller equipment in the plant.

Excitation for the main units is from three 250-volt exciters, one of which is of sufficient size to supply both generators while the two smaller are each sufficient only to supply one unit. The exciters for the 2,300-volt station generators are directly connected with the generator shafts. The circuit breakers and the rheostat equipment for the units are divided into two groups, one for each generator unit, and are located near their respective machines. All circuit breakers and rheostats are electrically controlled from the main switchboard. The voltage of the 2,300-volt generators is held constant by means of automatic voltage regulators which control the exciter fields. The voltage of the main exciter units is hand-controlled only and varied by changing both the resistance in the exciter field and the main generator field circuits.

Switchboard and Equipment

A room 48 ft.x28 ft. is provided for the main switchboard. This room is on the second floor of the high-tension switchhouse and is far enough from the engine and boiler rooms to fulfill its function as a supervisory station without the confusion and noise so often found in switchboard rooms.

All controls are on the sloping and small vertical section of the bench board. They are multiple-contact drum type switches with the usual lamp indicator arrangement for both circuit breakers and rheostats. Meters are mounted on the front vertical section and are of the round-face white-dial design. They are placed high enough to make them visible over the top of the bench board. The necessary transfer switches are on the lower sections. Relays and recording instruments are mounted on the rear panels of the vertical board.

The following lists indicate the instruments used for the various services:

Generators—Voltmeter, Ammeters, a.c.; Neutral ammeter, Field ammeter, Exciter voltmeter, Watt meter, Watt-hour meter, Graphic watt meter, Temperature indicator, Temperature recorder, Governor position indicator.

Transformers—Temperature indicator.

Outgoing Feeders—Ammeter, Watt meter, Watt-hour meter.

General—Totalizing graphic watt meter with remote indicating sender to watt meters in generator and boiler room.

Synchroscope with lamps and two voltmeters. Frequency indicator.

To facilitate the control of the steam equipment, a visual signal has been installed. Push-button switches at both the switchboard and generator floor control lights behind a glass plate on which are printed such words as: Start Generator; On Governor; Emergency and the like. A similar signal box, but without control, is also placed in the boiler room to the end that all persons interested may act in unison during any major plant operation. A demand indicator for signaling expected loads to the generator and boiler rooms is also installed.

Relays and Allied Equipment

To protect against unnecessary or prolonged serious interruptions and to keep damage to electrical apparatus at a minimum in case of breakdown, a complete installation of protective relays is used

throughout the plant. The main generators are protected by induction type-relays differentially connected against extensive damage in case of internal electrical trouble which might develop. This application of protective relays is the usual method of protecting these large generators throughout American central station systems today. If for any reason trouble should develop in the plant exterior to the generators, it is necessary that these generators be automatically dropped off the line in the event that any of the other protective devices should not function as anticipated. For this contingency, generator overload relays are provided having the time limit adjusted for comparatively long periods. The main transformers are protected against internal trouble by means of differentially connected induction-type relays, and in addition overload relays are provided. The differential-relay schemes used for the protection of both generators and transformers include in the alternating current circuit the major portion of the generator conductors and both the low and the high-tension bus. Experience has shown that faults to ground within the power house are fully as likely to develop on the cables and on the structure of the bus as within the generating and transformer units. Consequently differential protection was provided so that such faults could be cleared as readily as if the trouble had developed within the units.

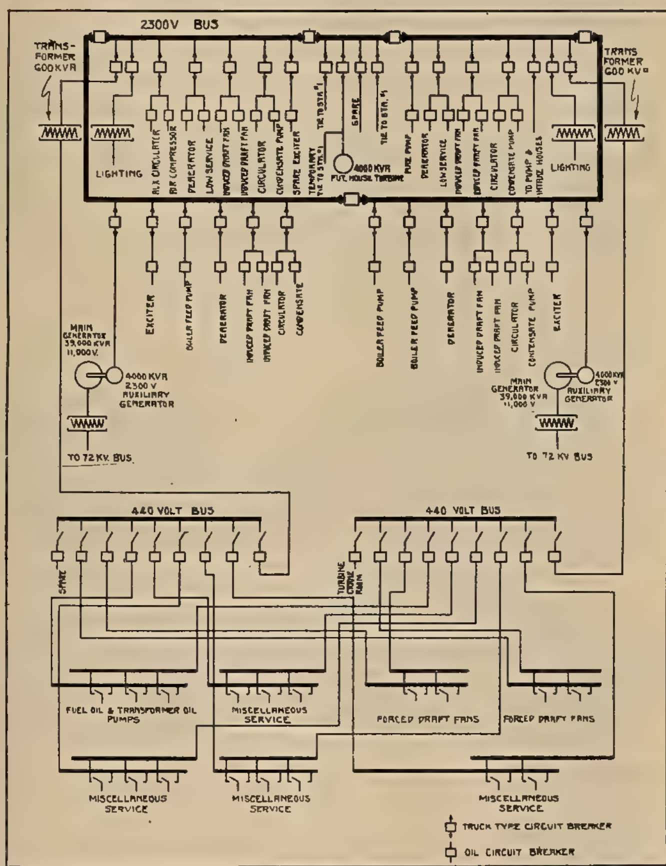
The outgoing 66-kv. feeders are equipped with induction-type overload relays so set that they will function in conjunction with the protective relays throughout the 66-kv. net work in case of transmission line failures. In this scheme Long Beach No. 2 is considered as a major generating source. The outgoing 60-kv. feeders go to the following substations: Cudahy, Somerset, Signal Hill, Carson, Watson, Laguna Bell and State Street, two of the feeders going to State Street. In the case of two parallel lines going to the same substation, use is made of current balanced relays. This type of relay has proved quite valuable in isolating faults in other portions of the 66-kv. net work where parallel lines are used.

Location of Relays

The relays which are used to protect the major equipment and the lines are located in the main switchboard room and mounted on a separate set of panels in the rear of the main switchboard. Oil circuit breakers are provided with a special alarm contact which operates an annunciator when the circuit breakers open for any reason other than by switchboard control. The annunciator signal indicates a group to which the circuit breaker belongs and quickly draws the operator's attention to the automatic operation and the trouble. In addition, annunciator contacts are provided for signaling high temperatures in generators and transformers, and provision is made to keep a permanent record of the transformer temperatures by means of a record curve-drawing instrument.

For the protection of the 2,300-volt auxiliary equipment in the plant, such as the house generators and the various motor-driven machinery which are supplied with motors above 50 hp. capacity, induction-type relays are provided for each circuit. While the house generators are handled from the main switchboard, the various motor circuits are controlled and protected by an assembly of truck-type switch panels. The oil circuit breakers for these feeders are hand-operated with induction-type relay trip circuits and are further equipped with the necessary contacts so as to sound an alarm in case of automatic opening. The motors of less than 50 hp. capacity operate at 440 volts and are protected in groups by means of induction-type relays and oil circuit breakers.

Provision was originally made for grounding the neutrals of the winding of the two 4,000-kva. 2,300-volt house generators. The grounding of the neutral of the generator winding is of advantage in isolating this generator from the system in case of internal troubles, but it is felt that there would be greater danger of accidental ground occurring on various portions of the electrical circuits fed from these generators than within the generators themselves. Under conditions of a ground on one of the circuits a



Single-line wiring diagram of station auxiliary service at new Long Beach steam plant.

severe short circuit would result in case of the generator neutral being grounded, whereas if the generator neutral were not grounded it would be necessary for two exterior grounds to exist simultaneously before a short circuit would develop. Instead of grounding the neutral it was decided that a reliable type of ground indicator should be installed on this 2,300-volt bus so that circuit grounds might be indicated and removed before serious trouble would result.

Grounding

In a station the size of Long Beach No. 2 it is quite necessary to provide an adequate electrical ground system. At this plant the grounding system might be classified in two divisions:

A—One to form a neutral copper bus to bring the ground current as directly as possible from the point of trouble to the neutral of whatever machine to which it may have a tendency to flow. And

B—To ground the structural steel and hardware so as to hold it at a common earth potential at the time of a short circuit to ground.

The main ground bus is of variable size, dependent upon the current that could be expected in its different sections in case of trouble. A copper conductor consistent in size with the generator leads is carried from the neutral of the generator to the generator frame and then parallels the generator leads to the case of the main transformers. The connection of this grounding bus to ground rods is incidental as it forms a conductor independent of the earth return usually relied upon. In a similar manner, the neutral of the transformer bank connections (on the star-connected 66-kv. side) is connected to the transformer case and to the base of all 66-kv. insulators of the bus structure. In addition, connections are made between the main transformer neutral and the frames of all oil circuit breakers and the neutral and cases of instrument transformers. This section of the ground, or neutral, bus is carefully connected to ground rods located near the main transformer banks. This latter provision is made so that ground currents, due to a transmission-line short circuit, will reach their normal destination, the transformer neutral, without passing through any station equipment or structural steel. To prevent any chance of ground current reaching the switchboard, the neutrals of the instrument transformers are grounded at these transformers, and no common or ground bus is used at the switchboard. The building ground is a continuous copper conductor that grounds the building steel at a large number of points. All hardware with which the operators may come in contact, such as the frame of the switchboards and instrument cases, is also grounded to this building ground.

To protect against excessive voltage disturbances on the 66-kv. outgoing feeders, outdoor-type oxide-film lightning arresters are provided on each line. These arresters are located on the north side of the switchhouse under the 66-kv. feeders.

At Long Beach No. 1 Steam Plant the 11-kv. bus is being rebuilt and strengthened. The old General Electric "Type H" oil circuit breakers, which were installed about fifteen years ago, are being rebuilt so as to increase the rupturing capacity. Current-limiting reactors rated at from 300 to 500 amp., 5 per cent, 11.6-kv. are being installed on all of the outgoing feeders. The various airbreak disconnect switches are also being equipped with locks so as to prevent a recurrence of blowing open at the time of a severe 11-kv. short circuit.

Sixteen Thousand People Inspect Japan's First Electric Home

By F. D. Fagan
Tokyo Electric Company, Tokyo, Japan

THE erection and exhibition of Japan's first electric home was made possible through the cooperation of a number of interested Tokyo firms. The fact that there was no association composed of members of the electrical industry at the time of the display speaks well for the organizers of the group sponsoring the electric home. Sixteen thousand persons visited this home, which was a distinct novelty to a country where electricity is destined to play an important part.

WHEN Japan's first electric home was proposed there seemed to be no association under whose auspices this home could be demonstrated. A committee was appointed by the sales manager of the Tokyo Electric Company, and after a few weeks' investigation arrangements for building and displaying it had been made with a building company, a real estate company, one of the leading newspapers of Tokyo, the the Tokyo Nichi Nichi, the electric street car company, a department store, a manufacturer of electrical heating and cooking devices, a lamp manufacturing company and the Tokyo Electric Company. These companies formed a committee and arranged for the division of expense and investment in the building of the electric home, and the real estate company agreed to take over the home at the expiration of the demonstration period. Construction work on the home was started in June, 1924.

The home, as designed by the committee, consisted of entrance hall, living room (foreign style) sun parlor, dining room, kitchen and bath room (Japanese style) on the first floor. The second floor was designed (foreign style)

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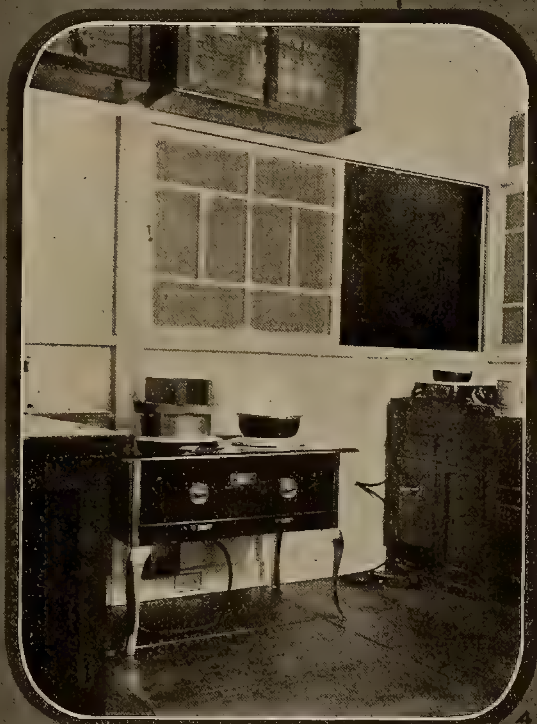

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VIEWS of Japan's first electric home, which was visited by 16,000 people who exerted a great deal of effort to get to the home (2) and inspect it. The bedroom, with its electric air heater, is shown in (1), and the Japanese-style tea room (3) contains other modern electrical devices. The library (5), located on the second floor, was fitted up with foreign-style furnishings. Note the heater, fan and numerous lighting fixtures. The kitchen (4) in the electric home was equipped with a two-plate range and many other modern electric labor-savers. The meter and fuse box may be seen above the range. During the time that the home was open to the public crowds were anxiously awaiting an opportunity to inspect it.

for a library and a bedroom (Japanese style). A pump supplied water from a well, and the laundry in a building separate from the house was equipped completely with electrical devices. All of the rooms of the home were furnished and completely fitted out with electrical devices for lighting, heating and cooking. A complete electrical installation, including a two-plate electric range was made in the kitchen.

Eighty Guests Attend Formal Opening

On Oct. 11, 1924 the opening ceremony was held. About eighty invited guests attended, it not being customary to open such affairs by inviting the general public. Viscount Shibusawa, one of the best known men in Japan, made a short opening address and closed the switch, thus supplying the house with electricity. Many prominent officials, college professors and leading members of the electrical industry were at the opening ceremony. The home was opened to the public Oct. 12.

On that day a large group of ladies, especially invited by the Tokyo Nichi Nichi, inspected the electric home and listened to lectures on home lighting and home building. On Oct. 16, the dealers of Tokyo were invited to be the guests of the Tokyo Electric Company and, after visiting the home electric, took part in a track and field meet which all were entitled to enter. Approximately one thousand dealers accepted the invitation in spite of the fact that it was a rainy day. This was the first gathering of electrical contractors and dealers ever held in Japan. It was reported as a very successful day and had the expected effect of bringing about a better feeling between the contractors and dealers.

On Oct. 26 the Princess Dowager visited the home electric and was much interested in the various demonstrations of the use of electricity in the home. A lecture on electrifying the home was given Oct. 29 in one of the large meeting halls near Uyeno Park, and several hundred people attended. Many prominent visitors were reported as having visited the electric home during the time it was open, among them being Viscount Shibusawa, Baron Mitsui, Mr. Nakamura, mayor of the city of Tokyo, Dr. G. Yamakami, Dr. Yamamoto, Dr. B. Natomi, Dr. K. Kishi and Y. Kamata, former minister of the department of education.

The home electric was located in the suburb of Tokyo called Chofu, on an electric traction line running between Kamata and Meguro. The reason for selecting this particular site was that it was not the desire of the committee to secure a large number of visitors who were only curious when the real aim was to secure the attendance of interested persons. As the fare from the city of Tokyo was from 25 cents to 35 cents, it was felt that all visitors were interested parties and not merely curious spectators. The weather was not as favorable during the twenty days as could have been desired as there were seven cloudy and rainy days, but in spite of the weather and the fact that it was the first home electric to be held in Japan there were 16,000 visitors to the home, the largest attendance being on the last day when 2,636 people were admitted. The smallest attendance recorded was on a day when there was a pouring rain and only 44 people were shown through the home. During one week of the time the electric home was open a special home-electric demonstration was held by the Mitsukoshi department store, which was interested in the exhibits. This demonstration consisted of a Japanese home completely equipped electrically. It is estimated that in excess of 150,000 people visited this demonstration.

The general opinion of all interested was that the electric home was a great success, and those investing money and sharing part of the expense were well pleased with the result. There were in attendance Japanese girls trained to talk on the uses of various devices, there being a girl in each room, and as the home was open from 8 a.m. until 8 p.m. two shifts of girls were used.

In Japan it is not customary to open a demonstration of this kind to the public all day. The morning was reserved for invited guests when they were privileged to see the home between 8 and 12.

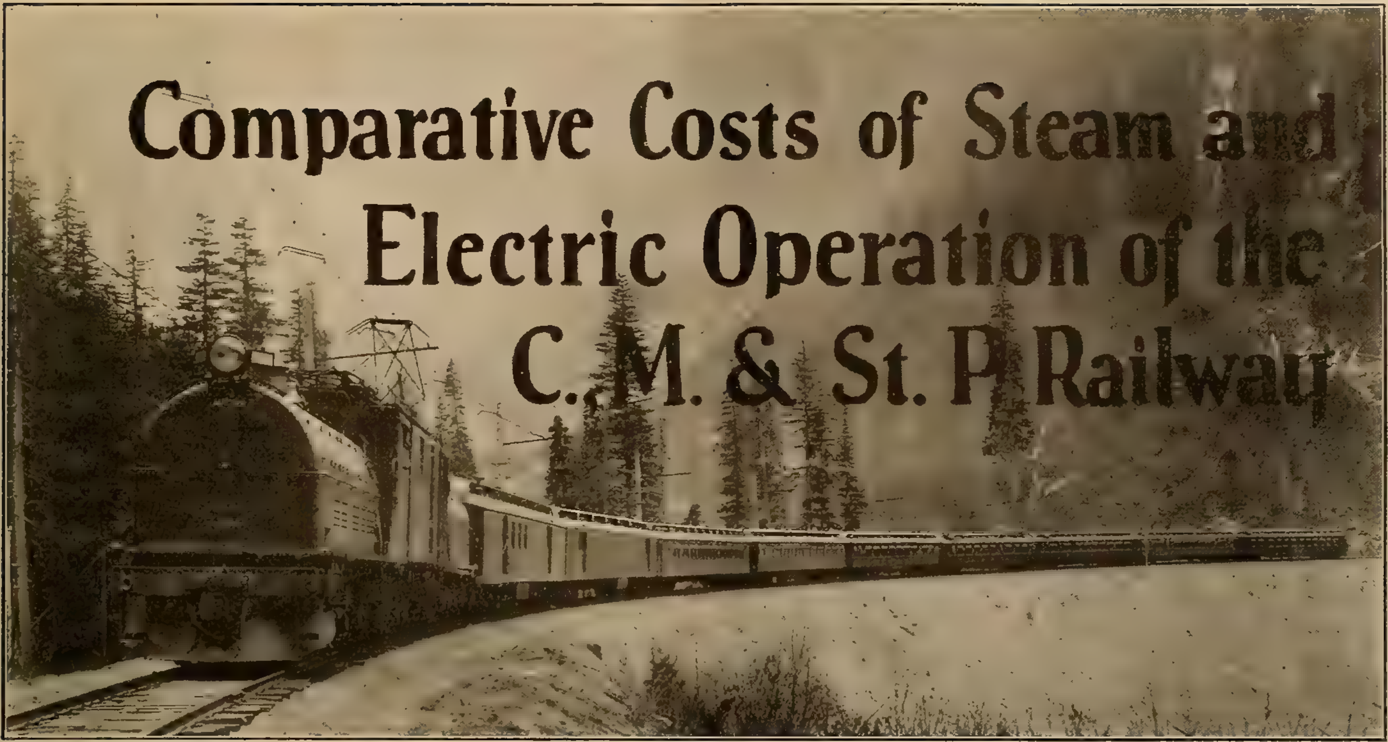
The home was purchased, prior to its closing day, by Mr. Shibusawa, son of Viscount Shibusawa, and he will make this his permanent residence.

This story may not be of particular interest to American readers, as the home electric idea is an old one in America, but the fact that such progress has been made in Japan is of great interest to those interested in the development of the electrical business in Japan.

Those interested in the electrical industry in Japan have not formed an association similar to the contractors, dealers, manufacturers, jobbers and central stations' associations that exist in America, but I am glad to say that the tendency is toward the forming of such associations. I believe that within the next six months some general association will be formed that will function to the interests of all the electrical industry. The electric home has done much to instill a spirit of cooperation in the minds of the leaders in the electrical fraternity, and much good undoubtedly will be forthcoming.

Great Advance Made by N.E.L.A. in Last Forty Years.—While the National Electric Light Association convention to be held in San Francisco June 15-19 is the forty-eighth convention, actually it will mark the fortieth year of existence of that organization. The apparent discrepancy in the year and the convention number is accounted for by the fact that semi-annual conventions were held until 1892. The association was organized Feb. 25, 1885, at Chicago in a room of the Grand Pacific Hotel. Eighty odd delegates were present to write the constitution and outline the future activities of the association. Today the organization has a membership of approximately fifteen thousand, several hundred being in foreign countries. Conservative estimates from association officials place the expected attendance at the San Francisco convention around five thousand. Sixteen subjects were considered at the first convention and included such little known topics as "Incandescent light, particularly in regard to length of circuit upon which they can be run with a profit."

Comparative Costs of Steam and Electric Operation of the C. M. & St. P. Railway



ELECTRIC operation of the Chicago, Milwaukee & St. Paul Railway Company on its Western extension over the mountain ranges in Montana, Idaho and Washington, because it is by far the most extensive operation of its kind ever undertaken—consisting of 650 miles of main line railway where all train movements, switching, freight and passenger, are performed exclusively by electric power — has attracted world-wide attention from those who are interested in the development and use of hydroelectric power as a substitute for steam power in railway transportation.

The mechanical features of the electrification and their advantages over steam operation are readily recognized from an inspection of the plant, but the vital inquiry of investigators as well as those financially interested in the company has been whether and to what extent there are economic advantages in electric operation versus steam operation.

A careful study of the cost of operation under steam on the identical districts which were afterward electrified has been made. It is based on an actual calculation of all the costs involved in both methods of operation and we believe it reflects accurately the relative costs of each. Only the direct advantages of electric operation have been taken into account. There are many incidental advantages and economies in electric operation which may not have been enumerated because of the difficulty in arriving at an accurate measurement of their values.

H. E. BYRAM, President,
Chicago, Milwaukee & St. Paul Railway Co.

ELECTRIFICATION of the main line of the Chicago, Milwaukee & St. Paul Railway Company on its Rocky Mountain division between Harlowton and Avery, Mont., commenced in 1914. By November, 1916, electric operation on 438 miles of main line and 128 miles of additional trackage on this division was an actuality. Subsequently—in March, 1920,—the division between Othello and Tacoma, Wash., comprising 208 miles of main line and 72 miles of other line, was electrified. In the interim between April, 1916, when the first section of electrified road began operating there has been an actual saving of approximately $12,400,007 in favor of electrification, or nearly 80 per cent of the total cost of the change from steam to electric power. The method of arriving at this figure is the subject of this article which reviews a report just issued by H. E. Byram, the president of the road.

Direct-current, 3,000-volt, overhead trolley type of electrification is used. Current is purchased by the railway company at taps in the company's high-tension transmission system, transmitted to substations where it is stepped down from 3-phase alternating current at 100,000 volts to 2,300 volts and thence converted through motor-generator sets to direct current at 3,000 volts for distribution to the trolley. The motors of the locomotives follow the regenerative principle, acting as generators when descending grades, thus returning current to the line and controlling the speed of the train without excessive use of mechanical brakes.

The extent of the electrified system and some of the pertinent physical features are shown in Fig. 1.

The method employed in arriving at the saving effected through electrification was to compare the cost of steam operation in 1923, had this form of operation been employed on the electrified systems, with the actual cost of electric operation for that period. The cost of steam operation was based upon the actual cost of operation during the last twelve months such operation was in effect, adjusted to the costs obtaining in 1923. Under either method of operation, some costs, within reasonable limits remain constant while others vary with different volumes of traffic. Consequently ad-

justments were made to compensate for changes in traffic and operating conditions between the period of steam operation and 1923. Figures used in making the comparision include only the operating expenses and the carrying charges of the investment in property directly affected by the change in power. Costs common to both steam and electric operation are excluded.

No savings were credited to electric operation which were not directly ascertainable as, for example, the possible increased revenue due to the release of equipment used in transporting coal under steam operation. Similarly, no credit was given electric operation for the better utilization of freight equipment due to faster movement, less wear and tear on road and equipment, reduced station expense and similar expenses affected by the number of trains required to handle a given tonnage. In the case of all these items it was impossible to determine an exact monetary value for these incidental advantages. In the same way, no credit was given for the increase in passenger revenue resulting from the attractiveness and greater comfort of travel under electrified operation.

Yet despite these savings which cannot be expressed in terms of dollars and cents, an actual economy of $12,400,007 has resulted from electric operation. This is shown in Table I. The net savings shown for any one year were obtained by deducting from the savings in operating expenses the carrying charges of interest and depreciation on the additional investment required for the electrification, which amounted to $15,625,739.

In Fig. 2 the costs of electrical and steam opera-

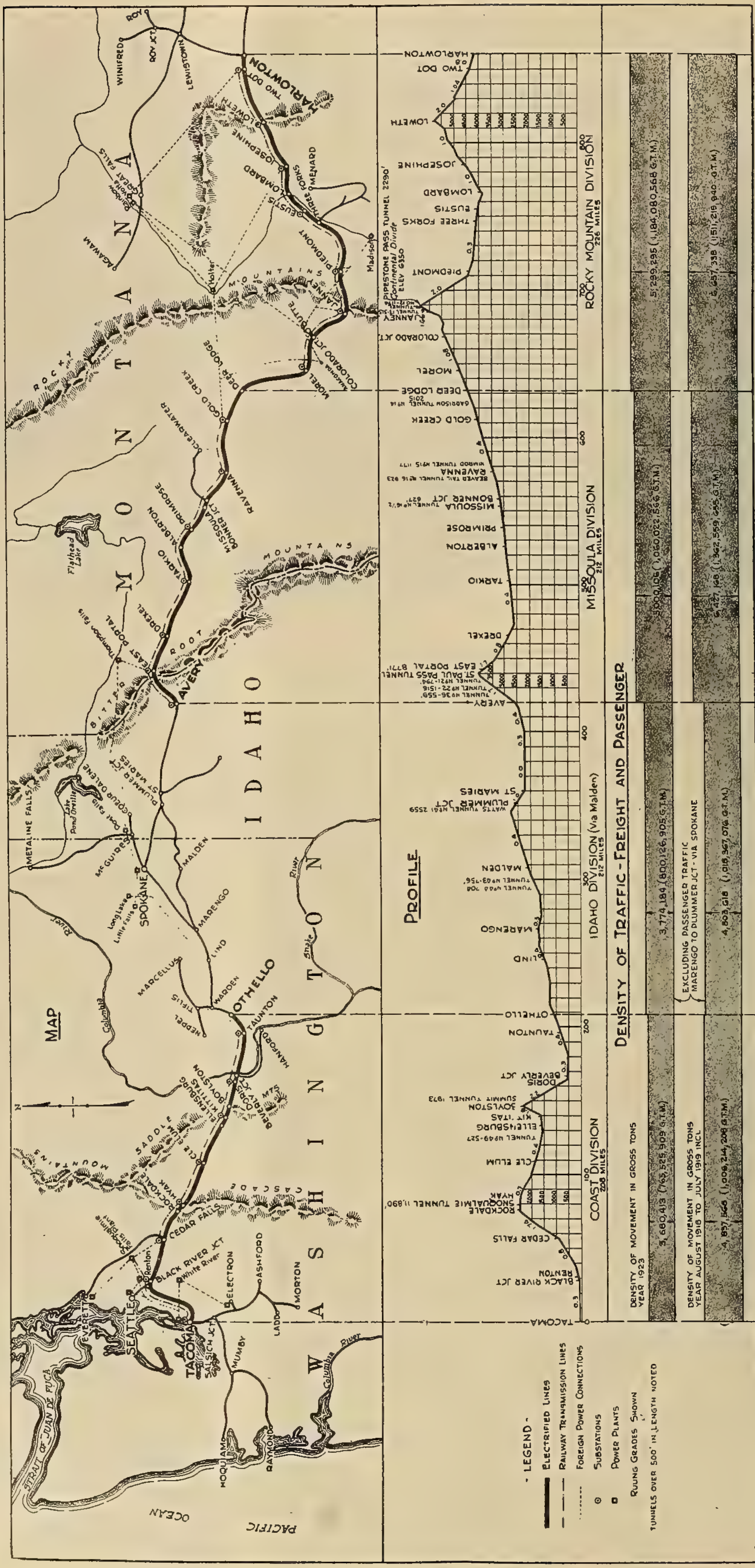


Fig. 1.—Condensed map and profile of electrified lines with density chart of gross tonnage movement.

Table I.

Years	Harlowton to Avery Electrical Operation began April and Nov., 1916		Othello to Tacoma Electrical Operation began March, 1920		All Electrified Sections	
	Volume of Traffic-Gross Ton Miles Frt. and Pass.	Net Savings by Electrification	Volume of Traffic-Gross Ton Miles Frt. and Pass.	Net Savings by Electrification	Volume of Traffic-Gross Ton Miles Frt. and Pass.	Net Savings by Electrification
1916	†1,639,054,000	†$ 1,098,166			1,639,054,000	$ 1,098,166
1917	2,677,097,000	1,641,369			2,677,097,000	1,641,369
1918	2,759,178,000	1,734,687			2,759,178,000	1,734,687
1919	2,894,063,000	1,888,037			2,894,063,000	1,888,037
1920	2,710,745,000	1,679,623	*691,674,000	* $249,003	3,402,419,000	1,928,626
1921	1,812,714,000	658,651	664,238,000	12,363	2,476,952,000	671,014
1922	2,109,868,000	996,485	734,121,000	103,301	2,843,989,000	1,099,786
1923	2,247,102,000	1,152,508	746,405,000	119,285	2,993,507,000	1,271,793
1924	2,129,426,000	1,018,721	691,476,000	47,808	2,820,902,000	1,066,529
Total		$11,868,247		$531,760		$12,400,007

†Tonnage and savings for 6½ months.
*Tonnage and savings for 9 months.

tion and the differences in the method of distribution of the costs are shown graphically for the volume of traffic as of the year August, 1918, to July, 1919, inclusive. Only such operating expenses directly affected by the change in motive power are included. In the construction of these charts the different expenses have been grouped with a view of bringing out clearly wherein each method of operation is the less expensive. They show that for all of the operating costs, with three minor exceptions, electrical operation is the most economical and only in the carrying charges on the investment in property not common to both does it prove more costly. However, the savings in operating expenses are more than enough to offset this difference and to show a substantial net saving in addition.

Such have been the savings that the sections of the line—Black River Junction to Seattle, a distance of 10 miles, and Avery to Othello via Malden, a distance of 212 miles, will without doubt be electrified in time, as electrical operation will not only effect savings on these sections but the continuity resulting will augment the savings on all of the electrified sections.

CHARTS SHOWING GRAPHICALLY THE DIFFERENCES IN COSTS AND DIFFERENCES IN THE DISTRIBUTION OF COSTS AT VOLUME OF TRAFFIC AS OF THE YEAR AUGUST 1918 TO JULY 1919, INCLUSIVE

INCLUDING ONLY OPERATING EXPENSES DIRECTLY AFFECTED BY CHANGE IN POWER AND CARRYING CHARGES ON THE INVESTMENTS IN THE PROPERTY DIRECTLY INVOLVED

NOTE Comparisons should not be drawn between the Coast and Rocky Mountain & Missoula Divisions from these charts as the vertical scales are different

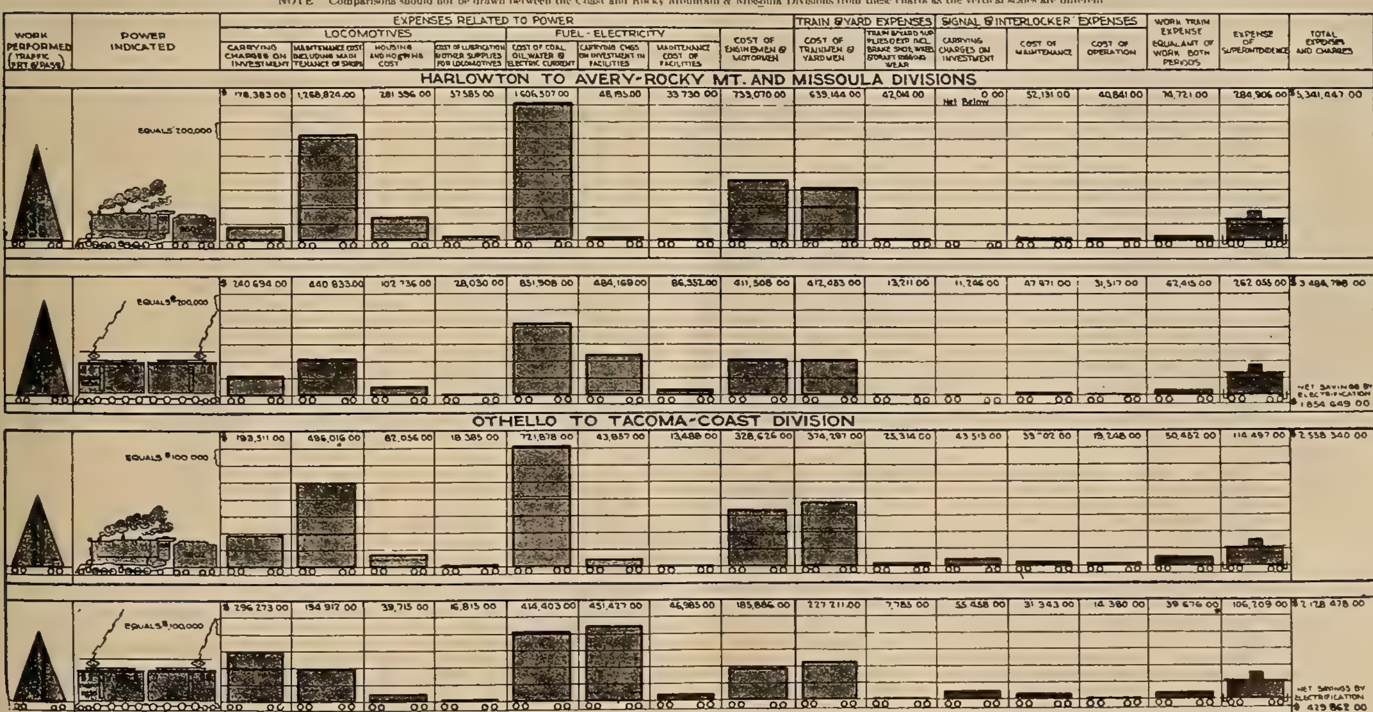


Fig. 2—Chart showing differences in cost between steam and electric operation.

CENTRAL STATION CONSTRUCTION OPERATION AND MAINTENANCE

Simple Rule for Connecting Current Transformers

Connecting Current Transformers for Differential Protection Facilitated by Simple and Accurate Rule

By LLOYD F. HUNT, Development Engineer, Southern California Edison Company, Los Angeles

Current transformers to function properly for differential protection of star-delta-connected power transformer banks must be connected to maintain the proper relative direction of flow of the secondary current of each unit with respect to the others. This seems to be a proposition that is often viewed with apprehension by those charged with the responsibility of making the installation. However, the making of proper secondary connections is readily reduced to comparatively simple fundamentals.

The following is a short, simple and exact rule for properly connecting the secondaries of current transformers for differential protection of star-delta transformer banks.

First, trace out corresponding incoming and outgoing high-tension leads of the power transformer bank and note the correct polarity of the bank.

Second, star-connect the current transformers on the delta side of the power bank by tying together three corresponding secondary leads.

Third, connect any of the three remaining leads of the starred current transformers to the same relative secondary lead of the corresponding current transformer on the opposite or star side of the power bank. That is, if the lead selected emerges from the current transformer on the side nearest the power bank it should be connected to the lead near the bank on the corresponding current transformer on the star side of the power bank, and vice versa.

Fourth, connect this same secondary lead to the relatively opposite secondary lead of the current transformer (on the star side of the power bank) in the phase which is common (on the delta side of the power bank) with the phase of the current transformer, the secondary lead of which was selected for the connection outlined in the above paragraph.

Fifth, complete the connections by following out the above directions for the other two pairs of current transformers.

It is important to bear in mind that in the above discussion the current transformer polarities are assumed to be the same. If the polarity of the current transformers on one side of the power bank is different from the polarity of those on the other side of the bank, the secondary leads of one set must be reversed after applying the above rule.

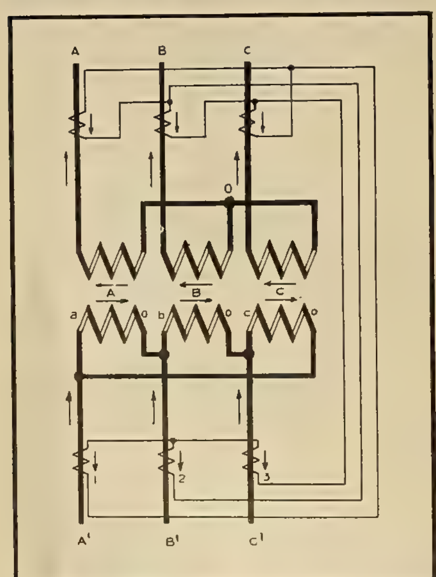


Fig. 1.—Wiring diagram of current transformer connections for differential protection of a star-delta subtractive-polarity power transformer bank. Arrows indicate direction of current flow assuming that power is being delivered through the bank from the delta side to the star side. The letters and figures are for the identification of the various units of current which are shown in their proper vectorial relation in Fig. 5.

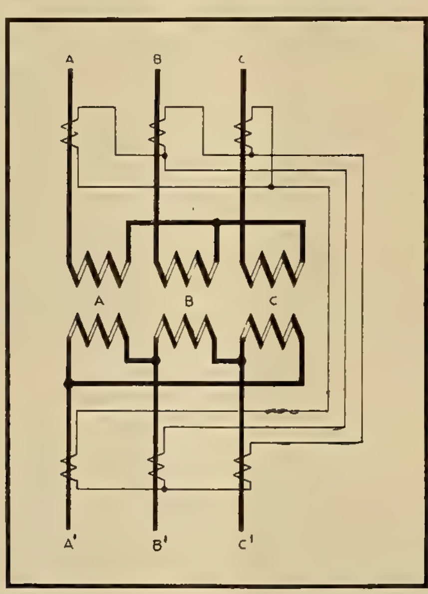


Fig. 2.—An alternate wiring scheme for that shown in Fig. 1, accomplishing precisely the same results. Power bank subtractive polarity.

Illustration.

To illustrate this rule and its application refer to Fig. 1, which shows a star-delta power transformer bank with current transformers properly connected for differential protection. The power transformers are of subtractive polarity. Therefore, phase leg A′ corresponds to phase leg A; phase leg B′ corresponds to phase leg B; phase leg C′ corresponds to phase leg C. The current transformers may be starred either as shown in Fig 1 or as shown in Fig. 2.

In the case shown in Fig. 1, the secondary lead of the current transformer in leg A′ should be connected to the outside secondary lead of the current transformer in the corresponding leg A. But phase leg A′ is also connected to the relatively opposite terminal of power transformer "C". Therefore, the secondary lead of the current transformer in leg A′ should also be connected to the inside secondary lead of the current transformer in leg C. Connect the secondary leads of the current transformers in legs B-B′ and C-C′ in the same manner.

Other possible connections equally correct are shown in Figs. 2, 3 and 4.

Vectorial Proof

To prove Fig. 1 vectorially, a simple method of using current vectors is given in the following discussion.

Assume current flowing out from the star side of the power bank and flowing in on the delta side of the bank. Then, since the polarity of the bank is subtractive, the current within the delta windings of the bank will be as indicated by the arrows adjacent to the delta windings in Fig. 1. Vectorial relations between currents A, B, and C are shown in Fig. 5. Tracing out Fig. 1 it is apparent that:

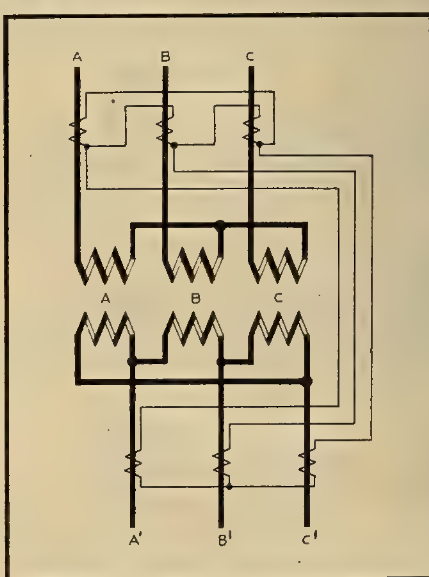


Fig. 3.—Current transformer connections for differential protection of a star-delta additive-polarity power bank where the power bank connections are made up slightly differently from those shown in Figs. 1 and 2. The net results are of course the same.

Current A′ = ao — co = OA — OC;
Current B′ = bo — ao = OB — OA;
Current C′ = co — bo = OC — OB.

The vectorial relations between currents A′, B′ and C′ as taken from the above equations appear in Fig. 5.

Since the current transformer polarity is subtractive and the star connection is made up as shown in Fig. 1, currents 1, 2, and 3 are the same as currents, A′, B′ and C′, respectively.

For the proper actuation of differential relays it is desired to have currents 180 deg. out of phase with which to balance currents 1, 2, and 3. Referring to Fig. 5 for the vectorial relations and to Fig. 1 for the connections, the following discussion will serve as proof of the correctness of the connection methods given in the foregoing rule. Since,

Current 1 = OA — OC, current to balance this, or X = — OA + OC, and, therefore, secondary lead 1 is connected to the outside secondary lead of the current transformer on leg A (this corresponds to the tail of the arrow, or negative lead(and to the inside secondary lead of the current transformer on leg C (this corresponds to the head of the arrow, or positive lead). Since

Current 2 = OB — OA, current to balance this, or X = — OB + OA, and therefore secondary lead 2 is connected to the outside secondary lead of the current transformer on leg B (this corresponds to the tail of the arrow, or negative lead) and to the inside secondary lead of the current transformer on leg A (this corresponds to the head of the arrow, or positive lead. Since

Current 3 = OC — OB, current to balance this, or Z = — OC + OB, and, therefore, secondary lead 3 is connected to the outside secondary lead of the current transformer on leg C (this corresponds to the tail of the arrow, or negative lead) and to the inside secondary lead of the current transformer on leg B (this corresponds to the head of the arrow, or positive lead).

Transformer differential connections may readily be checked by this comparatively simple vector method. The above detailed discussion and proof is given in order that the simple theory involved may be thoroughly understood. When this is accomplished, the application of this principle to the actual checking of connections on the job is quick, easy and accurate.

When connections have been checked and their correctness ascertained the relays should of course be connected into the circuit as shown at the right in Fig. 6.

Wrong Connection.

The question is often asked, "Why not star-connected current transformers on the star side of the power bank and delta-connected current transformers on the delta side of the power bank?" Such a connection is shown in Fig. 6. With this hook-up the differential relays would be caused to operate under many conditions of external or line troubles. For example, assume a single-phase failure, such as a flash-over to ground, to occur out on the transmission line, or in fact anywhere outside of the section supposed to be under the protection of the differential scheme. Such a fault is indicated at "X" in Fig. 6. The short-circuit current in this case will be only single-phase. Thus the short-circuit current will flow through leg CC′ and cause secondary currents to flow as indicated by the arrows. All the short-circuit current delivered must come from and through legs A′ and C′. Therefore,

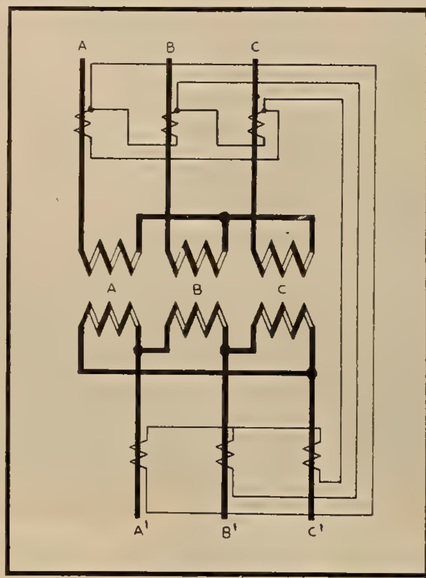


Fig. 4.—An alternate for the same condition shown in Fig. 3. Power transformers additive polarity.

Since the secondary current from the current transformer in leg A′ has no current from the current transformer in leg A to balance it, all of this current must return to the neutral through the differential relay, as shown by the arrow, and cause faulty operation. This condition is one which obviously proves out according to the simplest fundamental theory and has been proved experimentally by some users. Therefore, the scheme should not be used.

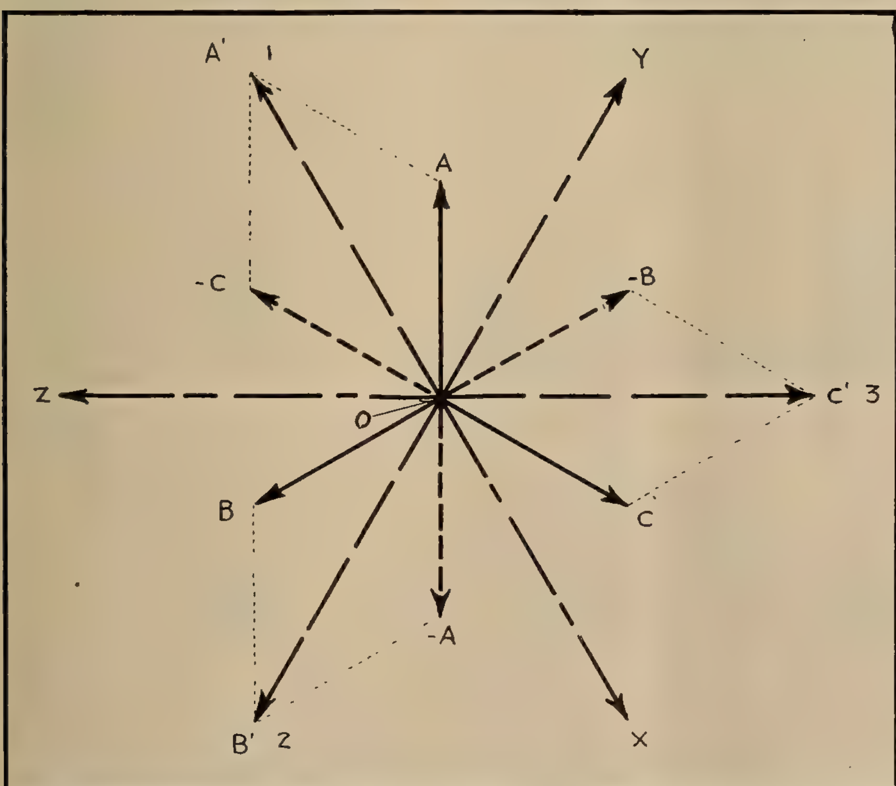


Fig. 5.—Simple vectorial proof that the secondary currents obtained with the connection scheme illustrated in Fig. 1 are of the proper physical relations to actuate protective relays for differential protection of a star-delta power transformer bank. The solid vectors represent the magnitude and relative directions of the currents within the current transformers on the star side of the power bank. The dashed vectors represent the magnitude and directions of the currents within the current transformers on the delta side of the power bank. The dotted vectors represent the "minus" or relatively reversed direction of the currents represented by the solid vectors. The dot-and-dash vectors represent the resultant current obtained by connecting each secondary lead from each current transformer on the star side of the power bank to a relatively opposite secondary terminal of an adjacent current transformer. These resultant secondary currents from the current transformers on the star side of the power bank are 180 deg. out of phase with the secondary currents from the current transformers in corresponding phases on the delta side of the power bank. This condition must exist when power is being delivered through the bank to insure the correct operation of differential relays under fault conditions.

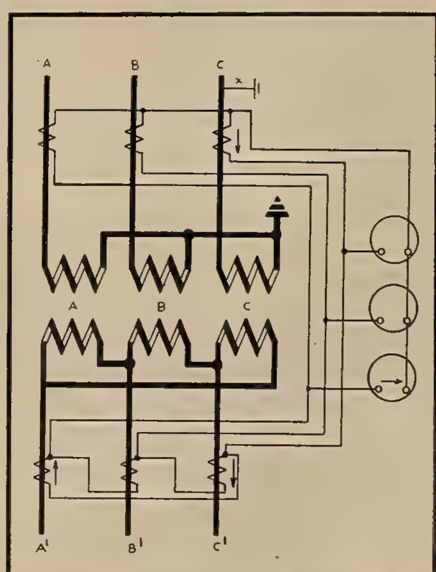
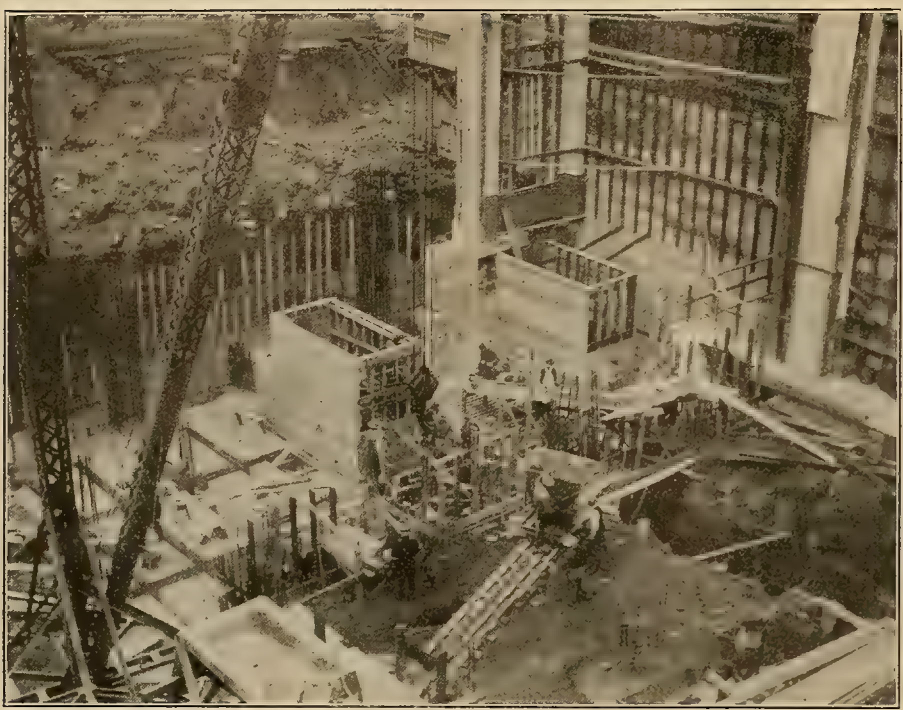


Fig. 6.—Showing the proper method of connecting relays into the secondary wiring for differential protection of a star-delta subtractive-polarity power transformer bank. The wiring diagram shows the current transformers connected in star on the star side of the power bank and in delta on the delta side. This scheme of connection is wrong because with it faulty operations of the relays will be caused when faults occur outside of the differential hook-up at any point such as that indicated by "X."



Construction work incident to extension of Big Creek No. 2 power house.

Big Creek No. 2 Power House Being Extended 56 Ft.

A 56-ft. extension is being made at power house No. 2 on the Big Creek development of the Southern California Edison Company. The accompanying photograph was taken Dec. 15, 1924, and shows the progress of the work up to that date, when the job had been under way for only a short time. Prior to the starting of this extension the construction crew had been engaged in making a similar extension to the No. 1 power house. The major portion of the work at No. 1 was done first because it is at an elevation 2,000 ft. higher than No. 2 and the weather is consequently more rigorous.

The building is being extended down stream a distance of 56 ft. up to the fourth floor level. This additional space will accommodate a fourth 17,500-kw. generator. Twin impulse wheels will drive the new unit. The forms for the pits of these wheels are being built as shown in the accompanying illustration. Above the fourth-floor line it will be necessary to make only a 14-ft. extension as the additional bus and switching equipment takes up less room than the generating unit. This will complete the development of the present power house.

San Juan substation of the Pacific Gas and Electric Company. This sub has just been partially rebuilt and is typical of outlying stations of a like capacity where loads of importance and 60,000-volt transmission lines are involved. The station bank, shown in the background, is of 3,000-kva. capacity and feeds both a 22,000-volt bus and a 4,000-volt bus. The 60,000-volt bus is stretched between the towers at the right and left of the illustration. The two incoming lines are taps from the Port Marion-Salinas-Soledad lines and come in onto the bus one through the standard switching-tower unit at the extreme left and the other through the unit at the right center. The transformer primary leads are taken from the bus through the older wooden tower at the left center. An outgoing 60,000-volt line to the plant of the Mission Cement Company takes off from the switching unit at the extreme right. It will be noted that current transformers are included on this switching unit. All 60,000-volt lines are protected by directional overload relays. The structure carrying the low tension buses may be seen in the background. The oil circuit breakers are manufactured by the company at its Sacramento shops. The oil-filled current transformers are also made by the company. The tower steel is supplied by the Pacific Coast Steel Company according to specifications made up by the Pacific Gas and Electric Company.

Fireproof Bungalow Built for Dispatcher's Office

Single-Story Building Designed for the Purpose Provides Separate Office for the Dispatcher's Force

A separate distinctive building of the bungalow type now houses the dispatcher at Terminal, Utah, on the lines of the Utah Power & Light Company. The building is comparatively fireproof, being constructed of hollow tile overlaid with stucco on the exterior and plaster on the interior. A Johns-Manville composition shingle roof and brick trimmings around the steel casement windows add to the durability and appearance of the structure. The main floor consists of a main operating room, a vault, a workroom and a telephone-line entrance room. A full basement underlies the whole main floor.

Efficiency of the dispatching force has been increased by the new building because of its modern equipment and the fact that it is far quieter than the old quarters on the third floor of the Terminal substation. Shadowless illumination is available over the entire operating room as the five 150-watt Trojan lighting units are so spaced as to distribute the light evenly.

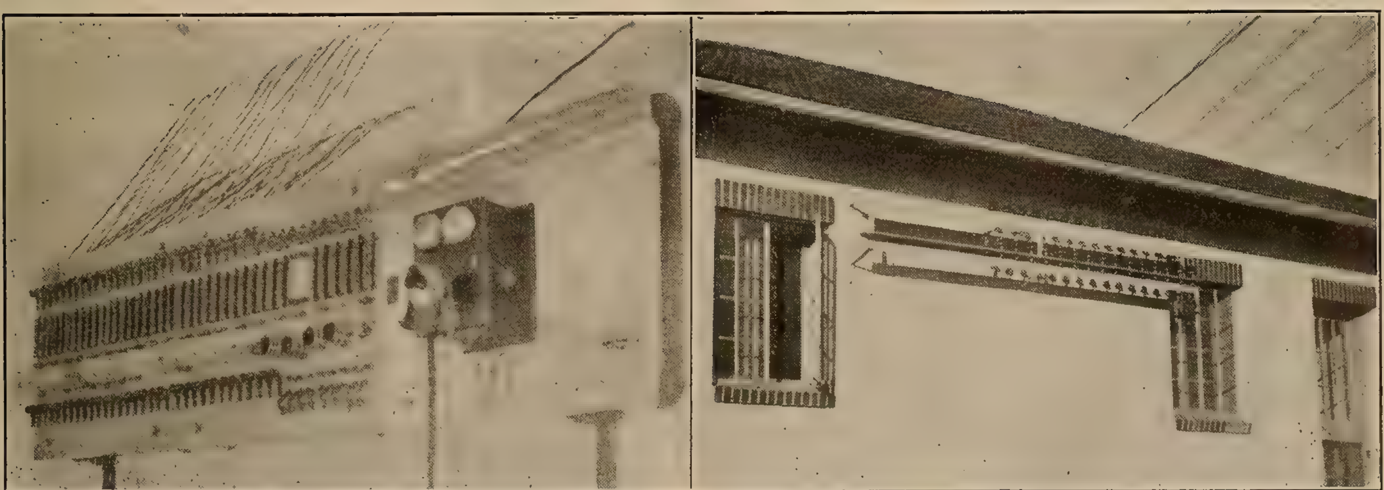
Heat is supplied through a hot-water circulating system of the latest design. An even temperature of any desired degree may be maintained through a thermostat heat regulator.

Open wiring is used exclusively in bringing the telephone lines in to the dispatcher's desk. The lines are so arranged that it is particularly easy to trace any trouble that might occur. No conduit or concealed work is used in the building in connection with the telephone equipment. It is believed by those responsible for this design that the open wiring system will materially help toward eliminating cases of trouble on the dispatcher's lines of communication within the building.

Windows are so arranged that a generous supply of light and fresh air is always available. Steel casement windows were used because they blend better with the building design and because they give more efficient ventilation for a given wall opening than do the more common sash. Ample storage room is provided in the storeroom and in the two vaults to take care of the operating records and files kept at the dispatcher's office. Filing cabinets, maps and similar equipment can be arranged conveniently and readily accessible in the operating room. Wall space provides plenty of room for the mounting of such system maps as are commonly referred to during dispatching operations. The dimensions of the operating room are sufficient to permit the dispatchers plenty of elbow room. The new office is neat and attractive in appearance both inside and outside.

Dispatcher Mueller at the new nerve center of the Utah Power & Light system at Terminal, Utah.

Exterior view of new hollow-tile, stucco-finish dispatching building of the Utah Power & Light Company at Terminal, Utah.



Arrester and main fuse board (left) and entrance rack (right) on the telephone lines entering the office of the dispatcher of the Utah Power & Light system at Terminal, Utah. Note the open wiring. No conduit is used on the telephone lines anywhere in the building.

IDEAS FOR THE CONTRACTOR

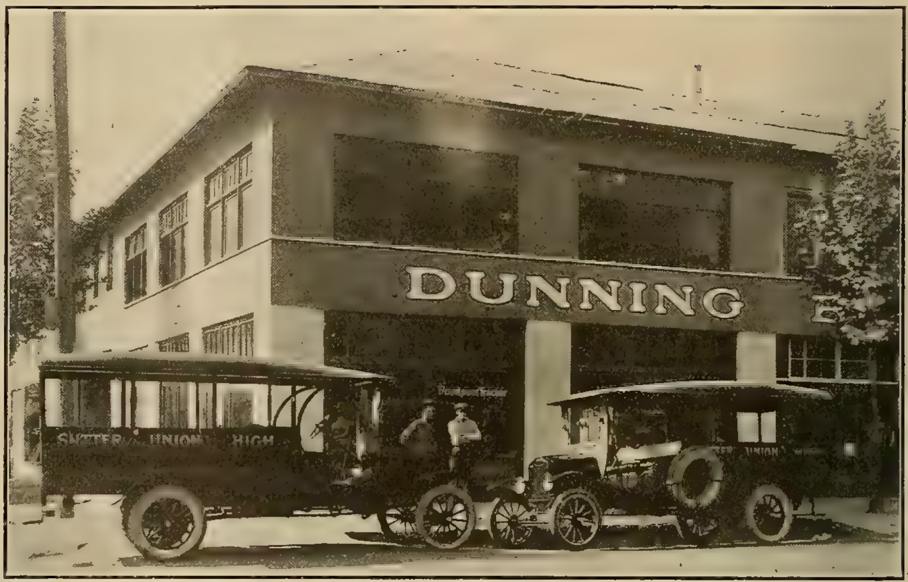
Marysville Business Man Sold On Complete Electrification

H. H. Dunning of Marysville is a firm believer in the universal use of electricity. He is now having a former garage remodeled into stores on the ground floor and fourteen two-room apartments on the upper floor. These apartments will be completely electrified, each having an electric range, water heater and air heater.

Mr. Dunning has recently completed a spacious garage in Marysville, where he has 60 employees. This garage has a completely equipped electrical kitchen where the noonday meal of the employees is prepared. Good wholesome food is served and the amount is unlimited, yet this meal costs the employees only twenty-five cents.

This is a new field for the installation of electrical equipment and offers an opportunity for the electrical contractor that should be developed.

LeRoy H. Crandall of the California Electrical Bureau was partly responsible for selling Mr. Dunning the "completely electrical" idea.



Garage of H. H. Dunning, Marysville, which is being remodeled into stores and fully electrified apartments. Mr. Dunning's new garage, recently completed, has an electrical kitchen for preparing the noonday meal of his employees

Electrically Heated Fire Houses New Field for Contractors

Two fire engine houses recently completed in Sacramento were completely equipped with electric air heaters. These buildings house the apparatus and provide living quarters for the members of the department. The air heaters are used to keep the apparatus warm so that it starts easily at all times, as well as to provide heat in the living quarters.

One of these modern engine houses is located at 43rd and J Streets in the residential district. The architecture of the building was made to conform to the architecture of the surrounding homes, and the accompanying picture shows how well this was done. This house is equipped with Wesix flush-type air heaters, there being one 2-kw., four 2½-kw., five 3-kw. and two 4-kw. heaters. Dean & Dean were the architects, and the electrical work was installed by Latourrette-Fical Company.

The other house is at 2nd and L Streets and is equipped similarly. Dean & Dean were the architects, and the electrical construction was by the California Mechanical & Electrical Engineering Company.

W. W. Mohrdick, formerly of the Mohrdick-Foran Electric Company at 1803 Castro Street, San Francisco, has recently established the Mohrdick Electric Company at 2258 Market Street, in that city. Mr. Mohrdick has also become a member of the San Francisco Association of Electrical Contractors and Dealers. He has been a member of the California Electragists for some time.

Electrolier System Financed by New Method

A novel and unique method of financing the installation of electroliers in Marysville, Calif., has been devised by the property owners in that they are paying approximately $1.50 per front ft. for the electrolier installation. In this way it was not necessary for the city to bond itself and sell the bonds, which will tend to reduce the total cost to the people. Fifty 400-watt Novalux electroliers with No. 1034 type standard will be installed, using a crystal glass shade. Four electroliers will be installed on each side of the street. This will be the first installation in the state using this electrolier. George W. Roberts has the electric contract for the installation.

Electrically heated fire engine house at 2nd and L Streets, Sacramento

Residential type of fire engine house at 43rd and J Streets, Sacramento,

Electrical Trade Associations Should Be Supported

Leaders Plan Constructively for Betterment of Conditions Within the Entire Industry

BY C. B. KENNEY

Manager NePage, McKenny Company, San Francisco

An analysis of the management personnel of electrical-contractor-dealer organizations shows that, in the main, the executives have risen from the ranks of apprentices and journeymen. Many of these men have worked up through various positions as estimators, superintendents and so on, before finally branching out into business for themselves. Doubtless this is equally true in other mechanical lines, and it seems the natural and proper course of individual advancement. This individual initiative and desire for advancement should be fostered and encouraged by those who have already established themselves in the commercial world. As an aid to the individual who is ambitious and to the concern that is desirous of proceeding along constructive lines, various trade associations have been formed and are functioning as guides in the establishment of business conduct. Almost without exception these associations are headed by men of experience and stability who are thinking and planning constructively for the betterment of conditions within the entire trade. For that reason as well as for individual advantage, trade associations should be staunchly and loyally supported.

This is particularly true in the electrical business where, on account of the great variety in classes of construction, ranging from repair work and very small jobs to the largest and most complex installation, the field is open to many of widely diversified experience. The small amount of capital needed for a start in electrical contracting and the very open supply market tempts many men to start out for themselves without a proper foundation in their trade and without financial training. For such men the trade association is most certainly a bulwark. This fact, however, is all too often not recognized and the small contractor-dealer, the man who has the most to gain from trade associations, is frequently the last to appreciate association advantages. Possibly these smaller firms are sometimes intimidated by the close association with the larger competitve organizations, but inasmuch as the basis of all trade organizations is mutual trust and confidence, this feeling must be entirely eliminated. It seems that it must indeed be a low type of individual who will break bread with a competitor and then be guilty of unethical trade practices. The larger firm has no need to fear the smaller, and the smaller should not permit itself to fear the larger, as the classes of work performed by the two organizations normally vary so widely in scope that there is no point of contact. The smaller concern is busied with house wiring, repair jobs and the various smaller contracts, while the larger firm engages itself almost entirely on the larger contracts which involve too heavy a financial outlay and hazard even to attract the smaller concern.

While it is commendable that journeymen should desire to work themselves into the position of master contractors and electrical contractor-dealers, it is nevertheless regrettable that most of these journeymen, when they finally do branch into the contracting business for themselves, do so absolutely without any adequate foundation, experience or knowledge of business methods. This applies not only to contracting but also to merchandising. The serious results of this evolutionary process are written in the figures relative to the mortality of electrical contractor-dealers. A detailed study of the major cities of the Pacific Coast shows that over 90 per cent of those who start in the electrical contractor-dealer business fail to remain in business for five years or longer. Of the remaining 10 per cent the majority by far are those who have had training or experience in merchandising and in the general conduct of business. While it is undoubtedly true that there are many occasions when men are justified in becoming master contractors prior to the time when they have had the experience that this business occasions, it is nevertheless true also that such men must look elsewhere than within themselves to supply the deficiencies of their own experience.

It is on just this fact that the various associations of electrical contractors and dealers base their existence. The entire thought of such associations is constructive in its nature. No intelligently guided association is proceeding along the basis of price control, for not alone is this unlawful but it is unsound economically. Fortunately, the various contractor-dealer associations of the West today, and particularly of California, number as their executives some of the keenest minds in the contracting branch of the industry. These association executives are devoting much of their time and no small amounts of money to the upbuilding of the association to the end that all of the members alike may enjoy the benefits that come from unity. Many of these benefits are founded on the rich experience of men who have spent years in contractor-dealer activities. The president of one of these associations is a man who has been conspicuously successful and who started in as an apprentice, working up through various stages of journeyman, foreman and superintendent, to the time when he owned his own business. His success has been due entirely to the fact that he followed out good business ethics. He has acquired a considerable competence, and is devoting a large share of his time to the activities of his association. In addition to this, very frequently and without publicity, he makes it possible for some smaller members to secure a contract that by virtue of circumstances naturally would gravitate to his larger firm.

Every member of the electrical business should have a deep-seated interest in trade associations, particularly in those associations which have to do with the contractor-dealer branch of the business. The contractor-dealer seems to be the keystone of the arch, and should this member fail, conditions would certainly be most chaotic. The cause of most of the failures in the contractor-dealer branch of the industry is indicated by the more than ninety per cent mortality rate in less than five years. As only ten per cent of those who start in the contracting business are able to weather the storm for five years or more, it becomes apparent that a condition exists that should command the interest and attention of every member of the electrical industry. Manufacturers, jobbers, central station employees, salesmen, managers, executives of all kinds, alike should interest themselves in contractor-dealer activities, and should participate as largely as occasion affords in the activities of such associations. Every effort should be made to eliminate sharp practices, unethical conduct and the many pitfalls that are placed in the way of legitimate business by those who would be guilty of unfair competition. Participation by manufacturers, jobbers and others also will benefit the contractor-dealer on account of the contacts that will follow and on account of the better understanding that can be established between the source of material supply and the source of material outlet. Closer cooperation between these two cannot but result to the mutual advantage of both.

One of the prime requisites for the successful conduct of any business is proper accounting. This has been one of the greatest weaknesses of the average contractor-dealer, and the failure to recognize the need for accurate financial records has been the cause of failure of a high percentage of the contractor-dealers who have not succeeded. Trade associations generally are sponsoring accounting systems that apply particularly to the electrical business and more particularly to the contracting branch of the business, and such jobbers, manufacturers and major trade associations have devoted special attention to this feature. Some of the more progressive jobbers have taken radical steps along this line and have assisted dealers in installing the accounting method that would be most beneficial. Various trade magazines have given their support to this movement at considerable expense, and devoted much of their space to constructive material for the benefit of the contractor-dealer. Central stations generally are glad to participate in these trade-association activities.

Since it is absolutely necessary to have some general channel for the installation of wiring materials that makes it possible to apply the various electrical devices manufactured, and since this channel has been definitely established as the contractor-dealer, it becomes immediately apparent that it is incumbent upon the entire electrical industry to lend its fullest support to this particular branch. Everything that can be done should be done to improve the status of the contractor-dealer, and to assist him in proper merchandising methods and in the establishment and maintenance of ethical practices.

The Wilshire-Beverly Electric Company was recently opened at 1727 Wilshire Boulevard, Beverly Hills, Calif., by F. W. Redfield, formerly of the Sani High Electric Company, R. T. Redfield, formerly of the Illinois Electric Company, and F. A. Griessen. The firm will specialize in the manufacture and installation of high-grade lighting fixtures.

Model Plant an Aid in Industrial Electric Field

Pacific Electric Motor Company Occupies Building Embodying Many Suggestions for Men Interested in Electrical Shop Practice

One of the latest developments of importance in the industrial electric field on the eastern side of San Francisco Bay is the new building of the Pacific Electric Motor Company, at Tenth and Oak Streets in Oakland. It is noteworthy because it enables that concern efficiently to broaden and thoroughly round out its activities and facilities for the complete electrical service of industrial organizations in the immediate community and in interior districts.

In the electromotive field the Pacific Electric Motor Company is in position to specify and supply any motors, controls and attendant apparatus that may be needed, including wiring, transformer installations and switchboards. Where stock parts are not suitable, it will design special apparatus and switchboards, as well as plan the development of special equipment for unusual jobs. Work of this character varies from installations for rolling mills and bascule bridges to single motors in small shops.

The industrial lighting activities of the company are similarly broad in scope. All phases of lighting installations are handled—fixtures, sizes, locations, heights and shadows. Specifications provide for the best use of materials in such ways as splitting up circuits and running high-voltage wires to transformers located near the point where the lights are to be installed. The advantages of flood lighting and special lighting on machines are considered for each individual case.

Personnel for handling this work is divided into administrative and engineering departments, in the latter being grouped the installation, shop, service, stock and shipping men.

Every phase of the plant equipment was given thorough and careful attention in the planning stage. Generous room was provided for the office, an estimating and planning room, shop, stock room with crane and steel shelving, and a well lighted sales room in which the full stock of motors and controls is displayed, together with a display of pulleys and other equipment carried.

Routing of work through the shop is given special attention in order that each step might be progressive and efficient. A description of the layout of the shop and the machines in use should be full of suggestions for every man interested in electrical shop practice.

An entrance for trucks leads directly to the stock-room office and under the runway of the 10-ton electric crane which is operated over a 100-ft. track serving the machine, assembly and disassembly sections as well as trucks and the motor salesroom. At this stock room the jobs are recorded and tagged as they come in, and the work orders for the shop are at the same time made out. New apparatus arrives by the same route and is checked into the sales room or out to installations that are under way, while stock parts and pulleys are segregated to the proper places in one of the twenty stacks of steel shelving and bins. Apparatus to be repaired is delivered to the shop assembly and disassembly section, which is adjacent to testing and cleaning apparatus and equipped with low steel tables and a 50-ton press.

Thorough testing is the first step in order for incoming jobs, of course, and for this reason the test board is located at the front of the shop. It is fitted with apparatus to test for grounds, shorts, opens and all other faults or defects, and when completed it will be the most complete installation of its kind west of Chicago.

The transformer room is situated directly above the test board, and through the floor an opening has been provided for running conduits and wires to the test board and distribution center. This transformer room is a fireproof vault, and in it are housed the main service oil switches and contactors, transformers, resistors and special apparatus. A special room is provided for generators, compressors and heating apparatus.

In a separate fireproof room in the same section as the transformer room are the dipping tanks which are served with a hoist and handling equipment. Adjoining is the oven provided with steel car and rack for carrying coils, stators and such articles.

Returning again to the progress of a job as it comes into the shop, it is seen that, following the testing, provision has been made for any sort of handling which may be necessary. The 10-ton electric traveling crane will place the job in the required position where any necessary stripping of gears, bearings, pulleys and so on may be done easily with the 50-ton press.

Following disassembly, the parts to be worked on at once go to the cleaning room while the balance of the job is sent to the holding section where a bench with sliding drawers is fitted up for keeping small parts segregated and in order. The cleaning room is of special, fireproof construction and is equipped with hoist, distillate tank and force pump, compressed air and an exhaust fan to carry off the fumes and dust.

When thoroughly cleaned, the jobs are sent directly to either the machine department or the winding department.

The machine department is equipped with two medium lathes and one 25-in. LeBlond. To the latter a compound head is to be added to increase the swing to 60-in. Grinding and buffing wheels, drill presses, power hack saws, shaper, milling machine and similar equipment are conveniently placed. All machines have direct drive by variable speed, d. c. motors and automatic push-button control.

Special heavy steel tables with built-in furnaces and heavy vise are used for babbiting. The furnace is supplied with gas and compressed air, and there is also a gas and compressed air torch. Bearings of any size may be cast, and all are bored to accurate dimensions. Special attention is given to securing proper grooves for oil, and bearings are made without blow holes and turned so that they are free from chatter marks. Provision is being made for reaming and burnishing bearings to absolutely accurate gage.

Throughout the shop, facilities are provided or planned for any class of machine work. Working conditions are pleasant; the lighting ideal by night as well as by day, and the work benches are heavy and wide with ample drawers sliding smoothly on steel guides, a drawer with lock for each man.

The winding department is equipped with insulation cutters, armature horses, low steel tables for heavy work and rotating tables for smaller jobs. The work benches are of 3-in. stock with Hallowell steel bench legs similar to those in the machine section. Each winding position carries a simple test set which is set flush with the back-board of the bench. Each main bench carries an auxiliary test panel for the heavier testing currents, both direct and alternating current. All positions are provided with compressed air and gas, and there is a gas stove for each two positions. A rolling crane serves the winding department together with a compressed air hoist for stripping old windings from stators.

Adjacent to the oven and dipping room and occupying one corner of the winding department is the coil winding section. Machines are here installed for winding, shaping and taping coils. Great care is taken to keep the benches in this section free at all times from dirt and all apparatus other than the coils being made. One bench is fitted wit hsteel racks for hanging coils and with foot-controlled vises for clamping them while taping. By locating this section close to the oven and dipping room the progressive scheme for handling jobs is followed out.

A special machine is being designed for winding the smallest or largest coils at very low or very high speeds up to 2,000 r.p.m. At these high speeds dynamic breaking is provided to stop the reels properly. It synchronizes the reels automatically so that they stop with the revolving head. A later article will deal with this machine in detail.

After the winding has been completed, the stator or arm is sent to the oven where it is thoroughly baked out before impregnating. Then, while hot, it is picked up by an overhead traveling hoist from the oven steel dolly and dipped in a thick, heavy insulating varnish of the highest quality. It is then drained, returned to the oven and rebaked. This produces a job which is highly resistant to oil, water and other foreign matter.

Thorough tests are made at this point and again after assembly of the motor or apparatus. The rule applied for breakdown tests is to double the operating voltage plus 1,000 volts. A record is kept of no-load exciting current, leakage, heating and other factors.

When a job is completed and checked with the inspector's approval it is returned to the shipping department where the records are completed and delivery made to the customer or to the shop service men who are making the installation.

Delay is avoided in winding any type of motor or apparatus by carrying a complete stock of magnet wire. In fact, the company carries a heavy investment in stock of all kinds in order that work at all times may be expedited, and details in the stock room therefore were worked out carefully.

The stock room is equipped with 300 steel boxes for small parts, and for larger material there are twenty stacks of steel shelving.

THE modern plant of the Pacific Electric Motor Company in Oakland is a model to be followed in electric shop practice. The illustrations show interesting parts of the shop. (1) The 10-ton electric crane for moving motors; (2) rear of shop showing steel work benches; (3) machine department with lathes; (4) exterior; (5) stock shelves and drawers which are of steel; and (6) oven and the dipping room.

1

2

3

4

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BETTER MERCHANDISING

Do Electrical Men Practice What They Preach?

San Diego Club Conducts Contest to Determine Number of Men Really Qualified to Sell "Electrify" Idea.

To prove to itself that its members were not "bald-headed barbers" nor "bare-footed shoemakers." The San Diego Electric Club inaugurated an "Electrify" contest designed to give an index of the relative electrification of the homes of those belonging to the club. The opinion of the leaders in the movement was that no man who did not believe in what he attempted to sell could make a success of placing his material in the hands of the buying public.

For three or four years all electric clubs and leagues have advocated, and built for demonstration, electric homes. Then it occurred to someone to inquire just how many really electric homes there were to be found among the homes of the men of the electrical industry itself.

Inspired by an "Electrify" campaign put on by an Eastern electric league, P. P. Pine, power sales engineer for the San Diego Consolidated Gas & Electric Company, and two years ago secretary-treasurer of the San Diego Electric Club, sought support of the idea to bring this matter to the attention of the club. He was assigned the meeting of March 3 to put over the "Electrify" idea, and the plans and arrangements he made promised an unusual meeting and after-effects for the San Diego club. The cooperation and enthusiasm he aroused by the idea suggest that other electric clubs might find in the idea similar response and good results.

To set a standard whereby a home might or might not be considered electrified, a questionnaire, as shown in the accompanying illustration, was prepared. On it were listed all the possible electrical conveniences of a home, with ratings given each appliance or outlet according to its relative importance or wattage. The points were totaled at the bottom of the sheet and the score determined.

Seventy-five was set as the minimum number of points a home should have to be considered electrical. The questionnaire was sent out to all members of the club, both resident and non-resident, with an urgent request, accompanied by stamped and addressed envelope, for the return of the questionnaire filled out completely.

Prizes for the contest were provided by a number of appliance concerns. The first prize, a complete percolator set, was donated by the power company; the second prize, a floor lamp, by the Southern Electrical Company; the third, a pancake-waffle iron, by Electric Supplies Distributing Company; and fourth prize, a fan, by the General Electric Company.

But completely electrical home-owners were not to be the only prize winners, according to the plans made by the "Electrify" committee. Two consolation prizes were awarded the two lowest scores. The winner of the first consolation prize received a turnover toaster, given by the Westinghouse Electric & Manufacturing Company, and the second was given a tumbler water heater by the Illinois Electric Company.

A special prize, a percolator donated by the Edison Electric Appliance Company, was offered as an inducement for non-resident members and guests who entered the contest. Another special prize, designed to draw into the contest those members of the club not from central-station, contractor, dealer or jobber organizations was offered to members from the telephone and street railway companies.

The rules of the contest, given on the questionnaire sent out by the San Diego Electric Club, were as follows:

DO YOU PRACTICE WHAT YOU PREACH ?

Fill in this form and see if your own home entitles you to membership in the SAN DIEGO

Lots of Prizes **Electrify Club** *Consolation Prizes Too*

OF ELECTRICAL MEN WHO ACTUALLY HAVE ELECTRIC CONVENIENCE IN THEIR HOMES

HERE'S THE LOW DOWN ON THIS QUESTIONAIRE

What Wiring and Outlets Have You? Take the table below, or any other table such as is used for figuring wiring jobs.

Opposite each room put down the outlets in that room. The first column is, as labeled, for ceiling outlets. An outlet means "where the wire comes through the ceiling," and each outlet counts one, even if it supplies a 2 socket or a 5-socket fixture. A drop light would come under this head the same as a chandelier outlet.

The second column is the space for side wall or bracket outlets. Each bracket outlet counts one even if there are two sockets on the bracket.

The last column is for "convenience outlets" or receptacles. Switches are not considered as separate outlets. A duplex convenience outlet counts 2 points. Multiple screw-in plugs, however, are not counted.

In the table below, the rooms shown in heavy type are those that count in designating its size, in real estate terms; viz., kitchen, living room, dining room, laundry, bedrooms, etc.

Having put down all the outlets you have wired up, then add together the ceiling outlets, the bracket outlets, and the convenience outlets (switches not being considered as outlets), and get the total.

Then count up the number of rooms in your house on "the real estate" rating of principal rooms. (See heavy type in table).

Divide the number of outlets by the number of rooms and multiply by ten, and that gives you the number of points to be credited for your wiring.

Figuring Up Your Appliances

In the spaces below will also be found lists of appliances of various sizes. Opposite each put the number that you have, and set down the proper number of points earned.

Add up the grand total of points for both wiring and appliances, and you have your rating "in points", for The Electrify Club.

SEVENTY-FIVE POINTS WILL QUALIFY YOU TO MEMBERSHIP IN THE CLUB

Fill out this Questionaire. Sign it and mail in Enclosed Stamped Envelope.

How to Count Your Wiring Outlets

Room	Ceiling Outlets	Bracket Outlets	Convenience Outlets	Example
Kitchen	2	2	10	
Parlor		3	7	
Dining Room	1		3	
Laundry	5	2	5	
Bedroom	1	1	4	
" "	1	1		
" "	2	1	6	
" "		1		
" "				
" "				
" "				
Bath Rooms	2	1	1	
Closets				
Porches	2			
Halls	3	1		
Totals	19	13	36	
Grand Total of All Outlites			68	

Number of Rooms 8

Number of Outlets divided by number of rooms and result multiplied by $10 = 68 \div 8 \times 10 = 85$ — 85

For the following small appliances count one point each—not more than two of same thing to count:

- Buffer and grinding set ... 1
- Christmas tree sets ... 2
- Cigar lighter ...
- Coffee grinder ... 1
- Curling iron ... 1
- Egg mixer ... 1
- Electric fans ... 2
- Electric phonograph motor ... 1
- Electric player piano ...
- Hair dryer ... 1
- Heating pad ... 2
- Sewing machine motor ... 1
- Soldering iron ...
- Electric clcoks ... 2
- Radio ... 1
- Vibrator ... 1
- Violet-ray machine ...
- Hand drill ... 1
- Hand vacuum cleaner ... 1
- Furnace control (thermostat) ... 1
- Motor driven air pump ...
- Electric gas lighter ... 1
- Toy clothes washer ... 1
- Toy electric range ... 1
- Electric mousetrap ... 1

Points ... 24 — 24

There may also be included in the above any appliance taking less than 300 watts that is not included in this or the other lists.

For 660-Watt Devices Count Two Points Each

The following appliances count two points each, but as before, not more than two of any one kind may be counted.

- Chafing dishes ...
- Egg boilers ...
- Grills ... 2
- Immersion heaters ... 4
- Milk warmers ...
- Percolators ... 2
- Plate warmers ...
- Pressure cookers ...
- Samovars ...
- Shaving mugs ...
- Toasters ... 2
- Waffle irons ... 4

Points ... 14 — 14

Include in the above any other appliance taking over 300 watts, but not over 660 watts.

Electric Irons and Radiators, Two Points Each

The following count two points each, but as many as three of each may be counted:

- Flat irons ... 6
- Radiators of the "sunbeam" type that are plugged in on convenience outlets ... 2

8 — 8

Count Portable Lamps One Point for Each Socket

The following count according to size:

- Portable or Table Lamps, Count one point for each socket ... 25 — 25
- Electrically wired furniture, such as wired beds or tables
- Count one for each socket or convenience outlet.

Devices Rating at Five and Ten Points Each

The following count five points each, but only one may be counted:

- Electric ice-cream freezer ... 5
- Electric fireless cooker ...
- Also, any electric appliance not included in the lists that takes over 660 watts and therefore has a special circuit ... 5

The following count 10 points each, but no more than one of each may be counted:

- Washing machine ... 10
- Vacuum cleaner ... 10
- Dish washer ... 10
- Mangle with electric motor, but not electrically heated ...
- Electric water heater (1,000 to 2 500 watts) ...

40

Heavy Consuming Appliances—20 Points

The following count 20 points each, but not more than one of each may be counted:

- Electric range of over 1,000 watts ... 20
- Electric refrigerator ... 20
- Electric mangle with electric motor and electric heat ... 20

60 — 60

- Electric water heater (over 2,500 watts).
- Charging plug for electric automobile.

Total points available for rating in The Electrify Club ... 256

(Please mail to Wm. Cyr, San Diego Cons. Gas & Elec. Co., San Diego)

Dear Bill —Here's my rating, ... points, and here's hoping for either a prize or, by gosh, a consoler.

Name ...

Company ...

Home Address ...

Questionnaire sent out by the San Diego Electric Club in the "Electrify" contest.

Wiring and Outlets

Take the table below, or any other table such as is used for figuring wiring jobs.

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In the table below, the rooms shown in heavy type are those that count in designating its size, in real estate terms, viz., kitchen, living room, dining room, laundry, bedrooms, etc.

Having put down all the outlets you have wired up, then add together the ceiling outlets, the bracket outlets, and the convenience outlets (switches not being considered as outlets), and get the total.

Then count up the number of rooms in your house on "the real estate" rating of principal rooms. (See heavy type in table.)

Divide the number of outlets by the number of rooms and multiply by ten, and that gives you the number of points to be credited for your wiring.

Figuring Up Your Appliances.

In the space below will also be found lists of appliances of various sizes. Opposite each put the number that you have, and set down the proper number of points earned.

Add up the grand total of points for both wiring and appliances, and you have your rating "in points," for the "Electrify" Club.

Those who could show that their homes rated 75 points were entitled to membership in the "Electrify Club." The total points available for rating in the "Electrify Club" were 256, and the winner of the San Diego contest scored a total of 208 points.

Interest in the contest was aroused through the sending out of the questionnaires and by means of the weekly announcements of the club. This announcement told of the contest that was to be decided at the March 3 meeting of the Electric Club and named the eight prizes that were to be awarded the winners.

In addition to the awarding of the prizes, the meeting was addressed by P. H. Booth, district manager of the Edison Electric Appliance Company, Ontario, who spoke on the "Electrification of the Home." Prizes were awarded by W. F. Raber, general manager of the San Diego Consolidated Gas & Electric Company.

The first prize for resident members was won by J. F. Munro, whose new home in San Diego had a rating of 208 points. A. E. Holloway, with a score of 175, took second prize for resident members, and Carl Heilbron won third prize with a rating of 151. Fourth prize went to H. R. Peckham, whose home scored 145 points. Consolation prizes were awarded to Percy Adams, whose score came to 33.3, and to Boyce Jones with a score of 34.5.

Winners of the "Electrify" awards at the San Diego Electric Club meeting. Left to right—Carl Heilbron, winner of third prize; John L. Bacon, mayor of the city of San Diego, who won the non-dealer-power company prize; Boyce Jones, winner of second consolation prize; J. F. Munro, who scored highest in the entire contest; and Percy Adams, whose score was the lowest. The lamp in the center, as second prize, was won by A. E. Holloway, and the fan, as the fourth prize, by H. R. Peckham. Neither was present at the awarding of the prizes.

The prize for non-resident members went to F. J. Arey of Los Angeles. Mr. Arey's home had a rating of 205. Mayor Bacon won the special prize for members of the club not belonging to the organizations of the central station, contractors, dealers or jobbers.

Favors consisting of frosted lamps were given to each guest at the meeting. Fines levied during the meeting were collected in electrical units. Credit for the success of the "Electrify" program was given to P. P. Pine by Herbert Rose, president of the club.

Abou Mohammed Broadcasts Some Success Slogans

By JOE OSIER.

"In business the middle way is best."

Abou Mohammed, a sheik who late in life made the sheiking business profitable, sat on a sand dune and stroked the hump of a camel reflectively. And—

Following a series of disastrous events, Abou had plenty to reflect upon. All his ventures had lost—his caravan scattered—his tribe departed—and his dream tent in the green oasis fallen about his ears.

His worldly possessions consisted of a mangy, humpy-lumpy, arm-chewing camel, a package of wormy dates and some untried philosophy, which, alone, sustained him.

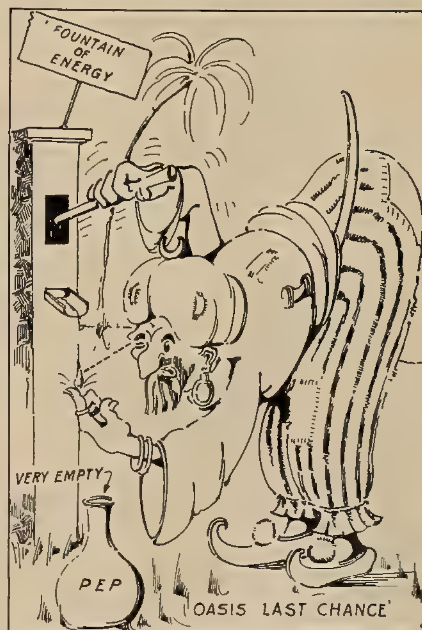
And so he philosophized: "Of little use to hammer cold iron" and again, "In business the middle way is best."

This said, Abou Mohammed wrapped a moth-eaten blanket around his shoulders, burrowed deeper in the sand and dreamed of yards of fiction and rods of film wherein and whereupon he was featured as the Sheik of Arabia who threw lovely ladies for losses in many Carnegie libraries and for many continuous performances.

Business men who find themselves in the same predicament as did Abou could profitably follow his example. When illusions totter and fall, when dream castles come smashing to earth, when cataclysm follows catastrophe—remember—

It is futile to hammer cold iron. Abou said so. Still, this self-same iron can be heated with new hope and new effort directed along more conservative lines and these lines, provided they lead to success, will lie along the middle course.

Bite off what you can chew—contract for that which you can accomplish—



Time for Abou to start digging!

promise what you can fulfill and walk breast-forward, unfearing in the eyes of your fellowmen.

And, when you are urged to leap and advance by bounds, accommodate your steps to those of the heavy sugar Johns who run as though they had eggs in their shoes.

Abou Mohammed fumbled the deck and misdealt once. The next time he slipped himself four aces—pat.

Latourrette-Fical Company of Sacramento, Calif., has recently been awarded the electrical contract on the new Union Electric Terminal to be erected at Eleventh and H Streets, that city. The Sacramento Northern Railroad will own the site and the building, although it will be used by the Sacramento Northern, the San Francisco-Sacramento Short Line and the Central California Traction Company. The contract amounts to $4,365.

Demonstrating the Advantages of Better Light

Adaptations of All Classes of Illumination Are Shown at Recently Opened Edison Lighting Institute

By H. KAY LYNN.

In the interests of the developing of the art and practice of lighting, the Edison Lamp Works of the General Electric Company has recently opened the Edison Lighting Institute at Harrison, N. J. The Institute is to be devoted to the service of the electrical industry, and in this capacity it will function as the experimental laboratory, school of merchandising practice and show window for the industry.

The Institute has been designed to satisfy the need for a practical means of demonstrating the correct applications of light, registering the advancements made in lamp-manufacturing methods and depicting the versatility of light. It is the desire of the Edison Lamp Works that the Institute give body and form to its service for the good of the entire industry.

The demonstrations conducted at the Institute clearly depict the ever-widening scope and influence of artificial lighting in all phases of our national life—industrial, commercial, and residential. They show graphically the potentialities of light as an industrial asset, as a business stimulant, as an instrument in scientific work and as a source of comfort and convenience in the home. They portray artificial light in its true character as a commercial commodity and cover completely the development, manufacture, merchandising and use of every type and style of incandescent lamp.

The exhibit has been housed in a specially designed building in Harrison so arranged that the individual displays may be shown to the best advantage. One of the features of the exhibit is a modern five-room apartment which has been lighted in approved fashion. These rooms, as well as the rest of the display, will be open to all who may be interested in better lighting.

On entering the Institute the first display of equipment to show the correct utilization of light is the reception room where there is an exhibit of lamps used at different periods in history that trace the progress in the science of lighting from early times to the present. Special attention has been given to the history and development of the incandescent lamp. Here is shown the lamp as Edison invented it in 1879. Then in sequence are arranged lamps incorporating new discoveries in material and improvements in methods of construction. In the reception room there is also a complete assortment of every type and size of incandescent lamp used in home, commercial and industrial service, from the 30,000-watt lamp, the largest in the world, to the tiny grain-of-wheat lamp used in surgical work.

The auditorium, a large room arranged and equipped for giving complete demonstrations on any subject pertaining to general lighting, is provided with a large amount of special equipment. These facilities permit the demonstrating of the three principal methods employed in commercial lighting, namely, direct, semi-indirect and totally indirect; effects that may be produced by color, distribution, intensity, direction and motion in window lighting; modern methods of stage lighting with disappearing footlights, overhead lights, spot lights and color lights; and high-intensity illumination from above the sky-light for lighting commercial or exhibition art galleries.

The other exhibits in the Institute are devoted to specialized demonstrations of the uses of light for various purposes. One of these is prepared to present the five different types of industrial lighting showing the effects of intensity, distribution, diffusion, glare, and effects of intensity of various colors used on walls and ceilings. Typical equipment used in the various fields of industrial lighting is included in the exhibit.

To illustrate good practice in modern street lighting, two model minature streets are used to demonstrate white-way or business section lighting and residence street and highway lighting. The street lighting exhibit contains a display of the principal types of poles, brackets, pendents and ornamental fixtures, glassware, and control and operation accessories used in different systems of street and highway illumination. Demonstrations of lighting for offices, lobbies, reception rooms and public buildings also are presented.

Modern store lighting is shown in a model store, complete in every detail where the advantages of good lighting and the disadvantages of poor lighting in the sale of merchandise are demonstrated. This exhibit shows proper methods of lighting a store interior, show cases, display material, and so on and includes a demonstration of how the appearance of a store may be changed by the use of high-level illumination. From another position an exterior view of the store is shown and a demonstration given of the effects of various intensities of illumination; the use of color lights, spot lights and any number of combinations of show window lighting systems.

Proper lighting in the modern home is displayed to advantage in the home-lighting apartment where five modern rooms—a living room, bedroom, dining room, kitchen and bath have been furnished to demonstrate a great variety of methods and types of lighting that may be employed to make the home comfortable and attractive. The use of elexit plates on all outlets other than the conventional convenience outlets has made it possible to show alternate solutions to each lighting problem in a practical and effective way. All lighting fixtures easily may be removed or interchanged and there are facilities for pointing out what is bad as well as what is good. In addition to the interest as a display the rooms are to be home-lighting experimental laboratories.

Another one of the rooms of the Institute has been designed as the concentrated filament and miniature lamp room. It is devoted to the applications of these types of lamps. Here are demonstrated different types of auto headlight beams, the effect of glare-reducing devices on these beams, control of light by special shape reflectors, the effect of manufacture and design of lamp filaments on the resulting beam of light. In fact, every problem pertaining to head lighting is fully demonstrated. Other parts of this exhibit show the application of lamps for use in automotive accessories; the correct type of lamp equipment and wiring for motor-bus lighting; the use of miniature lamps in toys; the application of beacon lights for use in air-mail service; flood-lighting projectors in various applications; demonstrations of motion-picture projection lamps and motion-picture screens.

The Institute has been given a definite task to perform in aiding the electrical industry to secure better lighting in all classes of installations.

The Auditorium in the Edison Lighting Institute.

1

DEMONSTRATION rooms in the new Edison Lighting Institute where modern lighting is to be exhibited and studied. Three of the rooms of the bungalow (1, 2, 6) illustrate the proper illumination of the home. Window lighting and a display of all types of lamps are shown (3), and in the miniature-lamp room (4) are exhibits of these types. The industrial exhibit (5) may be shown under a variety of conditions.

4

2

5

3

6

NEWS OF THE INDUSTRY

Opinion on Agency Disposal of Hetch Hetchy Power.

The question of whether San Francisco has the legal right to dispose of its Hetch Hetchy power through the agency of existing power companies is one on which there has been much discussion in that city. In an effort to make the matter more clear to the general public, the San Francisco Chamber of Commerce has printed in the March 6 issue of its organ, San Francisco Business, the pertinent parts of an opinion rendered by its legal adviser, Col. Allen G. Wright, of the firm of Wright & Wright & Stetson, in December, 1923. It also gives the following digest of the opinion:

1. San Francisco has no authority to sell or lease Hetch Hetchy power to any corporation for resale.

2. The city may enter into an agency agreement provided such agreement is not a mere subterfuge for wholesaling of power.

3. Under a lawful agency agreement compensation of the agent could be a fixed sum or a definite rate or any other definite compensation and all risks of the business would fall properly on the city as the principal and owner of the electric energy.

4. The legality of such an agency agreement was sustained by the Supreme Court of California in 1922 relative to a similar agency contract entered into by the city of Los Angeles pending the acquisition of its own distribution system.

5. The court held that this agency contract was not a violation of the letter or the spirit of the Los Angeles charter, the provisions of which were more restricted and more definite than the provisions of Sec. 6 of the Raker Act.

6. The Raker Act does not expressly oblige the city to go further than to transmit its electric power.

7. The main purpose of the Raker Act was to assure an adequate supply of water with the development of power as a by-product.

8. The obligations of the Raker Act may be weighed with relation to their own due proportions.

9. The Solicitor of the Department of the Interior suggests the use of such an agency contract as one solution under the Raker Act.

10. The city has an obligation under the Raker Act to use the electric energy developed or to offer it for use. If the people cannot be persuaded to vote bonds for power distribution, the city must, if it can, enter into an agency contract for the transmission and distribution of its electric energy.

11. Failure to distribute the power either directly or through an agency contract would expose the city to legal proceedings on the ground that the provisions of the Raker Act "are not reasonably complied with and carried out by the grantee."

Priest Rapids Hydro Project Is Granted Federal License

A license covering the Priest Rapids project of the Washington Irrigation & Development Company on the Columbia River about 50 miles east of Yakima, Wash., was authorized at a meeting of the Federal Power Commission held March 3. The license covers a 750,000-hp. development according to the company's application, the dam is to be two and one-half miles long and will form a reservoir with a storage capacity of 85,000 acre-ft. The dam will be composed of an earth-fill section at each end, a concrete spillway section, a powerhouse section, and a concrete gravity section having fishways, an ice chute and a lock entrance to provide for possible future navigation facilities. The primary power available at the site is 201,000 hp. The initial installation will be 340,000 hp. with provision made for an ultimate installation of approximately 750,000 hp.

At the instance of the Chief of Engineers the license is to carry conditions governing investigation as to the plans for the dam and the selection of its site, the preservation and protection of navigation facilities, the protection of fish (up to an expense of $300,000), the rights of irrigation projects to use of the waters, the maintenance of rights granted to the Hanford Irrigation & Power Company, which obtained a permit from the Secretary of War in 1906, and the determination of legitimate cost and investment by the commission.

Seek Six State Colorado River Compact Ratification

A movement providing for the reratification of the Colorado River compact to make it effective upon the approval of six of the seven states involved has been started by the Colorado Legislature. Action on the matter is expected from the States of California, Colorado, Nevada, New Mexico, Utah and Wyoming. The important portion of the resolution adopted by Colorado is as follows:

That the provisions of the first paragraph of Article XI of the Colorado River Compact, making said compact effective when it shall have been approved by the legislature of each of the signatory states, are hereby waived and said compact will become binding and obligatory upon the State of Colorado, and upon the other signatory states which have ratified or may hereafter ratify it, whenever at least six of the signatory states shall have consented thereto and the Congress of the United States shall have given its consent and approval, provided, however, that this act shall be of no force and effect until a similar act or resolution shall have been passed or adopted by the legislatures of the States of California, Nevada, New Mexico, Utah, and Wyoming.

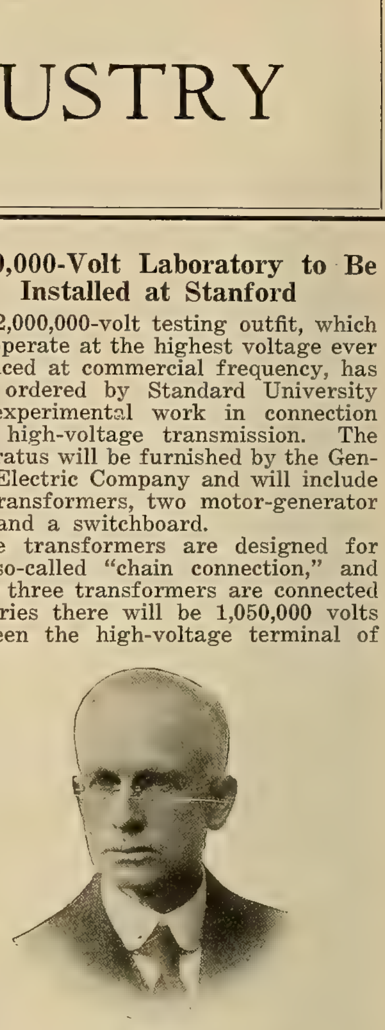
Wyoming has passed the resolution and the Legislatures of Nevada and California are considering it at the present time. The resolution introduced to the California Legislature carried a provision that the federal government first provide storage in the upper basin of the Colorado. In response to this provision Herbert Hoover, Secretary of Commerce, has requested that California remove any qualifications from its resolution.

Home Lighting Contest Featured in Power Company Organ.—The February issue of The Volt, published by The California Oregon Power Company, was devoted principally to announcing the winners of the Better Home Lighting Contest in the territory served by the company. Pictures of the winners were reproduced in the bulletin.

2,000,000-Volt Laboratory to Be Installed at Stanford

A 2,000,000-volt testing outfit, which will operate at the highest voltage ever produced at commercial frequency, has been ordered by Standard University for experimental work in connection with high-voltage transmission. The apparatus will be furnished by the General Electric Company and will include six transformers, two motor-generator sets and a switchboard.

The transformers are designed for the so-called "chain connection," and when three transformers are connected in series there will be 1,050,000 volts between the high-voltage terminal of the third transformer and ground. When six transformers are connected in series with the mid-point grounded, there will be obtained 2,100,000 volts between the outside terminals. It is expected that this voltage will jump a spark gap formed by two sharp points about 20 ft. apart.



PROF. HARRIS J. RYAN.

Prof. Harris J. Ryan, authority on high-tension phenomena and past president of the American Institute of Electrical Engineers, will be in charge of the experimental work in the new laboratory. He will devote his entire time to research in connection with the new equipment.

A modern laboratory for housing the apparatus will be provided, and adjacent to the building will be a large plot of ground on which a transmission line several miles in length may be constructed for carrying on tests under conditions approaching those of actual service.

Japanese Utility to Develop Two New Power Sites.—The Tokyo Electric Light Company, Tokyo, Japan, contemplates the development of two power sites at Lake Inawashiro. The plants will have capacities of 14,000 kw. and 23,000 kw. respectively. These sites have been held in reserve for some time by the company, and the decision to develop them at this time is the result of the increase in the demand for power since the Japanese earthquake.

Joint Development of Wynooche Proposed by Utility

Joint development of the Wynooche River by the city of Aberdeen, Wash., and the Grays Harbor Railway & Light Company has been proposed by the utility company. The company has submitted to the city council a proposition which provides for not holding the March 24 bond election at which the people of the city will vote on an issuance of $700,000 in bonds for the purpose of adding the Wynooche to the city's Wishkah River system. The company proposes that the city cooperate with it in the development of the Wynooche, the city to have the water supply, and the company the power development. The company declares that the joint development would guarantee the city an adequate water supply at a cost under $700,000. The company is represented in the discussion by H. W. Crozier of Sanderson & Porter, San Francisco.

A formal hearing will be held in Olympia March 30 in the office of the state supervisor of hydraulics on the application of the city for an extension of time to begin construction work on the Wynooche River hydroelectric project.

The request for the extension was contained in the answer made by the city to an order issued Jan. 5 requiring the city to show cause within sixty days why the rights of the city should not be cancelled, if development work had not been started before the expiration of that time. (Journal of Electricity, Feb. 15, 1925, p. 150.) The Grays Harbor Railway & Light Company, which also has filed on water power rights on the stream, later amended its application to recognize the prior right of the city to divert water for municipal supply.

Senate of Arizona Rejects the Colorado River Compact

A resolution proposing ratification of the Colorado River Compact as accepted by the other six states of the river basin has been defeated by the Arizona senate by a vote of 11 to 7, according to press dispatches. Three other resolutions proposing provisional ratification of the compact were withdrawn upon the defeat of the resolution referred to, and a resolution already adopted by the Arizona house of representatives taken under consideration. This resolution provides for ratification of the compact, if representatives of Arizona, California and Nevada can agree to a distribution of the water allotted to the lower basin that will be acceptable to a special session of the Arizona Legislature.

Oroville, Calif., Contemplates Acquiring Power System

The board of trustees of Oroville, Calif., recently adopted a resolution calling on the California Railroad Commission to evaluate the power and light system serving the town, with a view to its acquirement by the municipality. The system is operated by the Pacific Gas and Electric Company, San Francisco.

The question of the municipal ownership of the light and power system has been discussed in Oroville for some time, according to local report, and with the purpose of obtaining the consensus of opinion the board has stated that the question would be submitted to the people at a special election. Some months ago the formation of a utility district to include Oroville and the surrounding district was discussed, but the present plan comprises a strictly municipal district within the city limits.

In 1917, at Oroville's request a valuation of the system was made by the Railroad Commission, which set the figure at $97,000. As improvements have been added since then and parts of the system have depreciated in value, an adjusted valuation is now asked.

California Mountain Snow Pack Much Above Last Year's.

The snow pack in the California mountains is much above that of last year, according to the U. S. Department of Agriculture Weather Bureau, although it is from 60 to 72 per cent of normal. This is due to the fact that although snowstorms occurred frequently they were of short duration, and though there was heavy precipitation it was accompanied by comparatively warm weather and much of it was in the form of rain even at fairly high altitudes. The snow pack was increased, however, and there was much more snow on the ground at the end of February than there was at the same time last year. At the Summit at the end of the month the depth of the snow pack was 60 per cent of the nineteen-year average, at the Pacific Gas and Electric Company's Fordyce Dam it was 70 per cent, and at Tamarack 72 per cent. This is about the same condition as existed in 1923.

The February snowfall table follows:

STATION	Elevation	Total precipitation in Feb.—In.	Total snowfall in Feb.—In.	Depth on ground end of Feb.—In.	same date last year.—In.
Bishop Creek	9390	1.71	19	9	0
Blue Canyon	4695	18.21	43	4	0
Cascade	4900	6.90	6	0	0
Chester	4550	8.89	32	17	0
Cliff Camp	6150	8.94	29	21	0
Deer Creek	3700	19.25	9	0	0
Dinkey Meadow	5600	9.19	23	7	0
Downieville	3150	16.25	T	0	0
Fordyce Dam	6500	5.54	56	68	18
Giant Forest	6400	9.45	61	48	T
Helm Creek	8100	7.67	52	66	12
Hetch Hetchy	3665	13.05	7	0	0
Huntington Lake	6950	7.40	35	41	7
Inskip	4975	20.12	44	20	0
Lake Eleanor	4700	15.18	16	0	0
Lake Spaulding	4600	17.81	50	18	0
La Porte	5000	14.81	46	30	0
McCloud	3270	18.51	21	3	0
Portola	4832	4.23	21	0	0
Quincy	3409	10.27	3	0	0
Sierraville	5000	7.51	16	0	0
Sisson	3555	9.65	29	0	0
Summit	7017	7.00	70	66	24
Tamarack	8000	9.28	124	103	26
Twin Lakes	7970	10.28	97	86	20
Yosemite	3945	7.98	8	T	0

The snow pack was decreased considerably by the warm weather of the first few days in March, but snow fell again Mar. 6.

Washington Plants to Be Electrified.—The E. K. Wood Lumber Company's plant in Bellingham, Wash., is to be completely electrified, according to Fred J. Wood, president. The work is to start immediately. The Bloedel-Donovan Lumber Company, Bellingham, Wash., plans to expend $300,000 during 1925 in completion of electrification work in the company's big cargo plant.

Will Investigate Report on Rate Schedules in Denver

Reports that uniform schedules of rates are not maintained by the Public Service Company of Colorado in Denver are to be submitted for investigation by the grand jury now in session in that city. The company is requesting a renewal of its franchise in Denver and hopes to have the vote taken at the next city election in May. Denver men consider the investigation to be a preliminary step of the opposition to embarrass the campany in its request for franchise renewal.

It is generally believed in Denver that this co-called investigation of rates for electric service to Denver consumers will not have any effect on the franchise. Instead local opinion is that the investigation will prove of benefit to the company if a true statement of facts is made by the grand jury as to the various forms of rates now available, especially for large power consumers, a number of whom were subpoenaed to appear before the jury and present their monthly bills.

C. N. Stannard, vice-president and general manager of the company, has just returned from another conference with Henry L. Doherty in New York City, at which final plans were outlined in connection with the request for a franchise renewal.

The city council has not taken definite action which will assure this matter being placed before the voters at the city election early in May.

Application for Cowlitz County Hydro Project Filed

An application for the right to appropriate 225 sec-ft. of water from the north Toutle River, Cowlitz County, Wash., for generating hydroelectric power has been filed with Marvin Chase, supervisor of hydraulics, by Henry Waldo Coe of Portland. An application was also filed for reservoir rights on Spirit Lake to store 16,125 acre-ft. of water.

The water is to be used at a 700-ft. head and the plant will develop approximately 12,600 hp. at 70 per cent efficiency, the cost being estimated at $1,100,000. The power will be used for mining, lighting, manufacturing, and for the operation of a railroad in connection with the mining project. Any surplus will be sold to individuals desiring to purchase power.

The development involves the construction of a diversion dam 6 ft. high and 200 ft. long, an impounding dam at Spirit Lake 21 ft. high and 220 ft. long, and a flume line 9.75 miles long. The dams are to be timber-crib type, filled with rock, sand and gravel.

Transmission Line Contracts Signed by Tacoma Commission.—The last of the contracts for construction of the transmission lines of Tacoma's Cushman power project has been let by the commissioner of the light department. The Star & Steel Company of Tacoma will erect the towers which will carry the power cables spanning the Narrows. The bid for the towers and installing the cables was $148,803.55. Ward & Ward, Tacoma, will place the concrete footings for the towers. Puget Sound Bridge & Dredging Company, Seattle, will erect the steel towers on the city end of the line.

"Public Relations" Contest for N.E.L.A. Power Companies

A contest to determine "the most constructive public relations campaign carried on by a light and power company in a local territory during the past year" was inaugurated March 1 by Forbes Magazine. It is open to all member companies of the National Electric Light Association, and three prizes will be awarded for the best data and exhibits submitted. The following data must be supplied:

a. Plan of campaign and how conducted.
b. Exhibits of all types of advertising and literature used.
c. Record of achievements as indicated by customer-ownership results, increased use of appliances, increased sales of light and power.
d. Data indicating growth of good will.

All exhibits and papers must be in the offices of Forbes Magazine, 120 Fifth Avenue, New York City, on or before May 1, the day the contest closes. The judges will be:

Bruce Barton, Barton, Durstine & Osborn.
Philip Thompson, publicity manager, Western Electric Company.
M. C. Forbes, editor Forbes Magazine.
Louis Wiley, New York Times.
Ray Dickinson, Printers' Ink.
Thomas F. Logan, Thomas F. Logan, Inc.

The winner, in addition to receiving a certificate of award, will be presented with a handsome cup. Appropriately engraved certificates awarding second and third prizes will be given to the two next best exhibitors. It is planned to make the award at the N.E.L.A. convention in San Francisco in June. The three prize-winning exhibits will be taken to San Francisco and as many others of the next best as is practical.

Applications Filed on Western Washington Power Sites

Application for water power appropriations have been filed on two western Washington streams. R. F. Brown of Centralia, Wash., has asked for permission to divert 250 sec.ft. from the East Fork of the Cispus River, Skamania County, for the purpose of operating a plant with an estimated capacity of 20,000 hp. The water is to be used at a 600-ft. head.

Development work will involve the construction of a dam 100 ft. high and 400 ft. long. The completed plant will cost approximately $1,500,000. It will be located within the Rainier National Forest, and the power will be used largely for developing mining properties but will also be sold for commercial purposes. The dam and power house are to be of concrete construction.

An alternative application was filed on the Elwha River, Clallam County, by the Northwestern Power & Light Company of Port Angeles, asking for an appropriation of 600 sec.ft. of water to be used at a 150-ft. head. This plant would develop about 7,500 hp. of electric energy at a cost of about $800,000.

Curtis Lighting Announces New Merchandising Policy

With the organization of Curtis Lighting of California, Inc., to distribute all lighting products of Curtis Lighting, Inc., of Chicago, in that state, certain fundamental changes in merchandising policies of great interest to the electrical industry have been announced. It will be the policy of Curtis Lighting to market its indirect lighting fixtures through electrical trade channels, cooperating with the dealer-contractor wherever X-Ray fixtures or other types of fixtures are sold by the corporation.

During the past ten years X-Ray interior parts were sold through lighting fixture companies. The arrangement did not prove satisfactory, owing to certain construction ideas which did not assure that these interior parts with reflectors would be used properly. Therefore, Curtis Lighting now will furnish lighting fixtures complete, which assures the contractor-dealer and consumer that the highest degree of lighting efficiency is secured by this method of marketing.

Under no consideration will Curtis Lighting of California, Inc., sell the direct lighting products as covered by its catalog No. 22, known as the window-lighting lines, flood-lighting projectors, show case lighting equipment and direct lighting reflectors. All of these will be handled, as in the past, through the electrical jobbers.

The box line of indirect lighting fixtures also will be sold exclusively by the electrical jobbers who regularly stock these lines.

Stanford Electrical Engineering Fellowship Available

Announcement is made by Prof. Harris J. Ryan, Executive, Electrical Engineering Department, Stanford University, that there is available in that department of the university for the academic year 1925-26 a $500 fellowship known as the "Elwell Fellowship" after its donor, Cyril F. Elwell. According to the announcement,

It is required that an applicant shall have gained, at least, the degree of Bachelor of Science in Electrical Engineering or its substantial equivalent. A year's work normally leads to the degree of Engineer in Electrical Engineering.

Each application should set forth as far as may be practicable the plans of the applicant relating to his proposed program of studies, and also in relation to his probable choice of work following the year at Stanford. The applicant should request several persons who are competent to judge of his character and of his intellectual ability to write directly to the undersigned in support of his application. An essential part of every application is a transcript of all the grades made by the applicant in his previous college courses. This transcript must be an original document issued and certified by the registrar (or corresponding officer) of the college concerned.

Applications must be received by April 1. The fellowship will be awarded May 1.

The holder of the fellowship would be expected to have sufficient funds so that, with the assistance of the $500 attached to the fellowship, it would be unnecessary for him to do remunerative work during the university session to add to his income.

All correspondence on the matter should be addressed to Professor Ryan.

California Utility Construction Program.—The major construction program of the Coast Valleys Gas & Electric Company, Salinas, Calif., according to J. F. Pollard, its vice-president, includes the erection of a substation in that city at an estimated cost of $224,000; a 2,400-kw. substation at Gonzales; and the addition of a 2,250-kw. transformer bank to the Monterey substation. The company also plans to build at Salinas a 200,000-cu.ft. gas holder and 9-ft. straight shot gas generator and other plant improvements, and a warehouse and garages at Salinas and Monterey. G. F. Phythian, construction superintendent for the Byllesby Engineering & Management Corporation, will have charge of the work.

Colorado Legislature Considers Adequate Lighting Bill

The Electrical Cooperative League of Denver has sponsored a bill providing for standardized lighting in places of employment, education and amusement. This measure was introduced shortly after the opening of the general assembly in Colorado, but, although it has been printed and reported out by the judiciary committee, no formal action has been taken on the floor, owing to a political deadlock between the house and senate on administration matters.

The bill empowers the state labor commissioner and his inspectors to establish adequate standards of lighting as measures of safety, and provides also for enforcement. The bill as introduced would be somewhat of a departure and improvement over similar legislative enactments in other states, which have limited jurisdiction to matters of industrial lighting. The Colorado bill has included consideration of school buildings of all types and places of amusement.

The bill was introduced by E. S. Hawkins, a prominent Denver journeyman, a delegate from that ctiy in the state house of representatives.

P. G. and E. Company Occupies New Headquarters Building

The new seventeen-story headquarters building of the Pacific Gas and Electric Company at Beale and Market Streets, San Francisco, is almost finished, and the company's forces are moving in. Forty-eight head-office departments, with approximately 1,000 employees, will occupy the building.

This is the fifth time the company has found it necessary to move its headquarters, due to growth in the organization, since its incorporation in 1905. Originally in the Rialto Building, they were moved to the Shreve Building; after the fire in 1906 they occupied quarters in Franklin Street, whence they were transferred to 445 Sutter Street. In 1916 a new eight-story building which housed various departments, was constructed at 447 Sutter Street, but the company long since outgrew the space, and departments are quartered now in five different sections of the city. These departments all will be centralized in the new building, and the six- and eight-story buildings at 445 and 447 Sutter Street, that are being remodeled now, will be occupied by the San Francisco division. More commodious lobbies will be provided and there will be rooms for the display of the latest gas and electric equipment. All San Francisco business will be handled at these offices.

Progress on Baker River Project.—The dam on the Baker River development of the Puget Sound Power & Light Company, Seattle, is now 70 ft. above bedrock, according to W. D. Shannon, general superintendent for Stone & Webster, Inc. There are over 1,000 men on the job, and work is proceeding at a good rate. During January rainfall amounted to 14 in., with the rest of the winter in proportion; in February, however, there were only 10 in., so it is hoped that, with the promise of good weather, construction will advance at greater speed. Details of the Baker River plant were published in Journal of Electricity, Sept. 15, 1924, p. 220.

Edison Company Awards Cups for District Efficiency

Two silver cups, to be known as the Charles A. Coffin Foundation awards, have been purchased by the Southern California Edison Company with the $1,000 cash award accompanying the Charles A. Coffin Foundation Medal that was won by that company last year. One cup will be awarded annually to the district having the highest commercial record and the other will go to the district having the highest operating record for the year.

The commercial cup won by the Pomona district.

The first award of the cups has just been made, the Pomona district, C. E. Houston, district manager, and J. S. Kier, district superintendent, receiving the commercial cup, and the Long Beach district, W. P. Graef, district manager, J. F. Hodges, district superintendent, winning the operating prize for the year 1924. The commercial cup was awarded by a committee composed of W. L. Frost, general commercial manager, chairman; A. W. Childs, general sales manager; F. L. Greenhouse, manager of investment department, and Glenn Dalrymple, chief accountant. The committee awarding the operating cup included R. E. Cunningham, assistant manager of operation, chairman; Fred Hamilton, general superintendent of distribution; R. G. Boyles, superintendent of distribution; W. J. McCullough, general storekeeper, and F. C. McLaughlin, chief construction and operating accountant.

Considerable study was given to the awarding of the prizes and the following five major factors were considered for commercial activities:

General efficiency and cooperation.
Collections.
Sales.
Public Relations.
Appearance of company's properties.
Sale of company's junior securities.

These five major factors were subdivided into 28 sub-factors as follows:

General Efficiency and Cooperation.

(a) Number of errors in billing in proportion to meters July 1, 1924.
(b) Condition of office records.
(c) Promptness in submitting reports to general office.
(d) Cooperation with traveling auditors.
(e) Percent of clerical efficiency in proportion to applications submitted.
(f) Cooperation of district in handling applications.
(g) Personal appearance of commercial employees.
(h) Cooperation of district with sales department.
(i) Cooperation with credit department.
(j) Cooperation with securities department.
(k) Unit cost in handling consumer's accounts, consideration being given to district characteristics.

Collections.

(a) Relation of average number of accounts delinquent through year to total number of monthly accounts.
(b) Ratio of number of accounts delinquent to total number of accounts as of July 1, 1924.
(c) Relation of average number of closing bills delinquent to total accounts delinquent.
(d) Bad debt losses based on percentage of loss to gross income of 1924.

Sales.

(a) Percent of quota obtained in appliance sales.
(b) Lamp sales in relation to number of lighting consumers as of July 1, 1924.
(c) Window dressing as a sales medium.

Public Relations.

(a) Reputation of district in maintaining good public relations.
(b) Reputation of district for cooperation with civic and public organizations, Farm Bureaus, N.E.L.A., etc.
(c) Attitude of counter employees toward customers.
(d) District standing with newspaper editors.
(e) Percentage of Railroad Commission complaints.
(f) Esprit de corps.

Appearance of Company's Properties.

(a) Office appearance.
(b) Warehouse appearance.
(c) Garage appearance.

Sale of Company's Junior Securities.

(a) Percent of quota 7 per cent preferred stock.
Stock sales and resales in shares per district employees for 1924.
Percent new stockholders per district employees for 1924.

One hundred points were allowed for a perfect score for each sub-factor making a possible 2,800 points, and the thirty-one geographical districts were graded accordingly. The Pomona district, having the highest number of points for the 28 sub-factors, was awarded the commercial cup.

The awarding of the operating cup was determined by considering six major operating items.

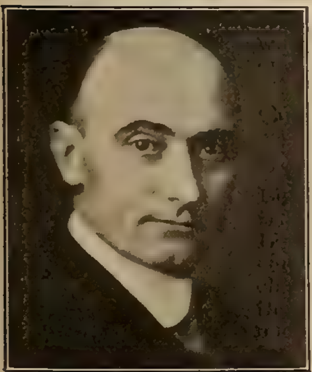
Construction efficiency.
Operating and maintenance expense.
Accounting accuracy and experience.
District store operation.
Labor conditions.
Accidents.

Construction efficiency was based on the percentage of labor to material costs. Operating and maintenance expense was based on ratio of actual cost to theoretical cost, taking into consideration the number of consumers. Accounting accuracy and expedience were based on accuracy of applications, accounting, filing and general. District store operations were based on stock turnover, cost of operation, average accounting conditions and average physical conditions. Labor conditions were based on labor turnover and the general labor situation. Accidents were based on industrial accidents, damage to others' property due to employees and automobile accidents, including company owned cars and damage to non-company owned cars.

The Long Beach district was awarded the operating cup for 1924.

Each of the above factors was divided into a possible 100 per cent as follows: Construction efficiency 30 per cent, operating and maintenance expense 30 per cent, accounting accuracy and expedience 15 per cent, district store operations 10 per cent, labor conditions 10 per cent, accidents 5 per cent.

The cups are of sterling silver and



C. E. HOUSTON

J. S. KIER

W. P. GRAEF

J. F. HODGES

were especially designed for the Edison company. They are 22½ in. high, have an extreme diameter of 13¼ in. and are appropriately decorated, depicting the generation and distribution of electricity.

The cups will be displayed in a conspicuous place in the principal offices of the districts to which they were awarded, with a printed explanation nearby so that customers and the public may learn the story at a glance. It is the intention of the company to award the cups yearly to the districts having the best record for the previous calendar year, and it is expected that there will be a healthy rivalry between the districts in order to deserve the cup for each year. It is believed this will have a beneficial effect upon local operating conditions.

Consider International Aspects of River Development

Washington Correspondence.

Opinion in Washington is divided as to the best course to pursue in the matter of the international aspects of the development of the Colorado River and Rio Grande. The Minister of Foreign Relations for Mexico has issued a statement to the effect that Mexico does not desire to consider the equitable distribution of the waters of the Rio Grande as a separate issue and would like to consider that question in conjunction with the distribution of the waters of the Colorado.

While the principle of the prior appropriation and beneficial use of water applied internationally. In fact, the State is contended that this principle is not applied internationally. In fact the State Department policy is based on an opinion by Attorney General Judson Harmon which sustains that point of view. As applied to the Colorado, it would mean that Mexico would acquire no prior right by putting water to beneficial use if the water of the river should be increased before lands on the lower river in American territory were ready to make use of the water.

Regardless of the letter of international law, other officials point to the fact that the United States almost without exception has made concessions when dealing with a smaller or weaker country. If the low water flow of the Colorado is increased it is certain that it will be put to beneficial use in Mexico where there is a large acreage which can be easily and quickly developed as the Colorado is regulated. While it may be in entire accordance with international law for the United States subsequently to deny this increased water supply to the lands below the Mexican border, it is practically certain, some officials declare, that no such step will be taken. For that reason, they urge that the treaty negotiations which were interrupted in 1913 be resumed at the earliest moment.

On the other hand, there are other officials who believe it to be entirely unnecessary to have any understanding or treaty with Mexico dealing with the American development of the Colorado River. Under international law, they point out, the United States has absolute and exclusive jurisdiction over the Colorado River within our territorial limits. "We maneuver ourselves into a very undesirable and unnecessary position," they say, if we assume that we must delay the development of the Colorado River to suit the pleasure of Mexico. In similar fashion, however, Mexico controls important tributaries of the Rio Grande. It is in a position to trade concessions of value to American settlers in the Rio Grande basin for rights to Mexican lands on the lower Colorado.

The whole question is being considered actively by the State Department at the time. It is expected that a policy which will be pursued in connection with the Rio Grande and the Colorado will be worked out in the near future.

National Lamp Works Issues "Four Star Book for 1925."

The 1925 edition of "Four Star Book", published annually as a reference book for its dealers, has been issued recently by the National Lamp Works of the General Electric Company, Nela Park, Cleveland. The four stars from which the book takes its name stand for:

Star One—Get people in. Plan your windows, your outside signs. Make your store look attractive, and make it known by its look, to people who pass.

Star Two—Display your goods. Plan the way your stock is arranged, have articles identified, remind folks of the merchandise which most people buy.

Star Three—Talk your goods. Make sales, instead of waiting for most of them to start with the customer. Plan your selling.

Star Four—Go out and sell. For every sale made in your store there are many others to be made outside. Get them—by going where they are. Plan for volume and turnover.

This "Four Star" plan, it is explained, grew out of the experience of the most successful of thousands of store-keepers in the industry.

Excellent illustrations depict various window trims, store displays, and selling aids, with detailed descriptions and prices given on a separate page. "Ten Tips on Outside Selling" give pertinent hints on that subject.

Much space is devoted to the advertising scheduled to be carried by the company in nationally known mediums, with special pages for advertising to women, to merchants and to factories, outdoor advertising, hints for local advertising, and suggestions for advertising novelties that please customers. A cordial invitation is extended to the dealer to visit Nela Park and also to attend the lighting school courses given there, or, if that is impossible, to avail himself of Nela service.

Washington Water Power Company Plans Duplicate Circuit for Railroad.—The new 110,000-volt Taunton-Neppel power line built last spring by The Washington Water Power Company, Spokane, has been cut in. This line runs from Taunton on the Chicago, Milwaukee & St. Paul Railway, where it makes a contact with the 110,000-volt Intermountain line that supplies the railroad, to Neppel in Grant County, 26 miles, where it connects with the new Grant County transmission system. It is planned to have this Taunton-Neppel line form part of the 110,000-volt line that is now being built from the Long Lake power plant to Stratford, a distance of 86 miles, where it will merge into a line running to Neppel. This latter line, which now has a capacity of 60,000 volts, will be rewired and insulated for 110,000 volts. When these plans have been effected, the result will be a complete new 110,000-volt circuit from Long Lake to Taunton.

Electric Grain Elevator Built by Vancouver Company

The largest grain elevator on the Pacific Coast was put into service at Vancouver, B. C., Jan. 12, by the Vancouver Grain Company. The elevator has a storage capacity of 2,250,000 bu. of grain and is designed to be capable of handling between 75,000,000 and 100,000,000 bu. of grain per year.

A 1,000 kv. substation is installed in the building to handle the power and lighting load. Service is from the 12,000-volt line of the B. C. Electric Railway Company. The latest in switching, control and metering equipment has been built into the substation. Power-factor connection has been provided for in the installation of a set of static condensers. Power is supplied at 550 volts from a bank of three 300-kva. transformers while two 50-kva. units feed the lighting circuits at 220 and 110 volts.

Forty-five motors varying from 3 to 125 hp. and aggregating 1,831 hp. are installed in the plant. Three-phase, squirrel-cage motors are used throughout. All motors of more than 5 hp. are equipped with autostarters.

Construction work was handled by the Pacific Construction Company, Ltd. The building was started Aug. 1, 1924, and finished Oct. 9, 1924.

Japanese Utility Orders Large Turbine Generators

Orders for two 35,000-kw., 11,000-volt, 50-cycle turbine generators and two 1,000-kw., 3,300-volt, 50-cycle house turbines have been placed with the International General Electric Company by the Hayakawa Electric Power Company of Kawasaki, Japan. The equipment represents the largest complete units ever sold by any company for export. The Hayakawa company will use the apparatus in parallel with its hydroelectric station in the Hamamatsu district for furnishing power to Toyko. The Hayakawa company is a subsidiary of the Toho Electric Power Company, which holds a controlling interest in the Daido Electric Power Company, one of the largest and most important power amalgamation in Japan.

The Toho company recently received from the International General Electric Company a 35,000-kw., 60-cycle steam turbine generator for use in the city of Nagoya in the southern part of Japan. The two turbines ordered for the Kawasaki station are physically larger than the one for the Nagoya installation. Each will have a net weight of about 785,000 lb. The rotors will weight 60 tons each, and will be 30 ft. long and 4 ft. in diameter. Except for the rotors, the apparatus will be shipped disassembled. The first complete turbine will leave Schenectady this summer.

Heating Patents Upheld By Court.—W. Wesley Hicks, electrical manufacturer of San Francisco, has received judgment in his suit against A. R. Fierce, O. W. Forsyth and the Electric Heating and Manufacturing Company of Seattle for infringement on his patents covering certain basic principles of electric heating apparatus. Judgment was handed down by Judge Frank H. Kerrigan in the southern division of the United States District Court for the Northern District of California on March 9, 1925.

News of the Electragists

Plans Progress for One Body Of California Electragists

An organization known as the Southern California Association of Electrical Contractors and Dealers was recently formed by the various local associations in the southern part of the state. At the present time it is the amalgamation of eleven already existing contractors' associations and covers approximately twenty-five cities. There is a number of associations in other cities already organized and being organized in local groups, and these will affiliate immediately with the central organization.

The plan of organization is as follows: An executive board made up of an executive committeeman from each local association. These executive board members are: C. E. Gregory, Compton Electric Company, Compton; J. F. Zweiner, San Diego; W. A. Rowley, The McNally Company, Pasadena; G. F. Crumm, Standard Electric Company, Van Nuys; L. C. Hart, Hart Electric Company, Moneta; P. H. Needham, Beverly Hills; S. F. Jones, Winder & Jones, Covina; P. R. Machtolf, Machtolf-Doll Electric Company, Glendale; H. L. Stolper, H. L. Stolper Electric Shop, Burbank; F. E. Elser, Los Angeles; J. J. Farley, Farley Electric Company, Fullerton; Frank McGinley, Harbor Electric Company, Wilmington.

From this executive board the following committee has been appointed by the president: Frank McGinley, Harbor Electric Company, Wilmington; F. E. Elser, Los Angeles; J. F. Zweiner, San Diego; J. J. Farley, Farley Electric Company, Fullerton.

The officers elected are: President, H. H. Walker, H. H. Walker Company, Los Angeles; vice-president, Frank McGinley, Harbor Electric Company, Wilmington; secretary-treasurer, C. W. Jones, Pomona Fixture and Wiring Company, Pomona; C. J. Geisbush, formerly field secretary of the Electrical Safety Exchange, which has become part of the association, has been appointed field secretary of the new organization.

The executive committee is to meet with a similar committee of four from the California Electragists, the organization covering northern California, for the purpose of completing details establishing a statewide organization of California electragists.

This committee is composed of: Victor Lemoge, president of the California Electragists, Walter F. Price, executive secretary, and C. L. Chamblin, California Electrical Construction Company, all of San Francisco, and H. H. Courtright, Valley Electrical Supply Company, Fresno.

This meeting will be held in Los Angeles March 27.

This is the outcome of a meeting of contractor-dealers held in Los Angeles Feb. 11 at which tentative plans were outlined. These were ratified at the quarterly meeting of the California Electragists held in Sacramento on Feb. 14.

The proposed amalgamation is to be put into effect at an early date.

Electrical Inspectors to Meet in San Francisco in March

The California Association of Electrical Inspectors will hold its semi-annual meeting in San Francisco, March 26, 27 and 28, in Room 251 of the Board of Public Works in the City Hall. Letters have been sent to all city electricians urging their attendance at this important gathering. Interested members of the electrical industry also are invited to attend. Among the more important subjects that will be discussed at this meeting are: uniform ordinance for the Pacific Coast and standardized interpretations of the Code, 1925 National Electrical Code as recently recommended by the code committee of the American Engineering Standards Committee under the sponsorship of the National Fire Protection Association; diversity factors for heating and cooking loads; wattage limitatoins for branch circuits; single-pole fusing and switching; proposed changes in general order No. 64 of the Railroad Commission; proposed changes in the Industrial Accident Commission rulings; street lighting; report on the actions of the Western Association of Electrical Inspectors.

NePage, McKenny Company, San Francisco, has recently been awarded the electrical contract on the Clift House Annex which is being erected in that city. The electrical work will amount to approximately $35,000.

Eureka Annual Convention City of California Electragists

The sixteenth annual convention of the California Electragists will be held at the Eureka Inn, Eureka, during the first week of August, 1925. This is the result of a mail ballot recently conducted by Walter F. Price, executive secretary of the California Electragists. The delegation of electragists from Humboldt County has advised the association that the Chamber of Commerce of Eureka had pledged an entertainment fund of $750 if the convention was held there, and this offer has been accepted. It is hoped that a large number of the members will plan to attend the convention as part of their vacation trip. Details of the arrangements are being worked out and will be announced iin a later issue.

Northern Counties Development League Meets at Corning

The Northern Counties Electrical Development League held its regular dinner meeting at Corning, Calif., Feb. 26, with twenty-eight members present. The principal speaker of the evening was LeRoy H. Crandall, field representative of the California Electrical Bureau. Mr. Crandall gave an interesting address on organization and what it means to the contractor and dealer; and on merchandising major electrical appliances. A general discussion of better wiring standards followed, and many interesting points were brought out by the members.

Nollenberger & Dorner, electrical contractor-dealers in Denver, have dissolved partnership. Theodore Nollenberger will continue the business under the name of Nollenberger Electric Company.

Pacific Coast Electrical Association

Report Is Presented on Meeting of Apparatus Bureau

A complete report on the meetings of the apparatus bureau of the Technical Section of the P.C.E.A. held in San Francisco, Jan. 7-9, has been prepared for the members of the association by C. E. Schnell, San Joaquin Light & Power Corporation, and W. L. Winter, Westinghouse Electric & Manufacturing Company, secretary of the committee. The report is presented below.

Oil-circuit-breaker design and application were fully discussed by the apparatus bureau under the direction of Mr. Schnell. Increasing concentrations of power upon the systems of power companies have brought about increasingly severe operating duty upon the circuit breakers. Particularly is this true under conditions of short circuit.

Various methods of increasing the rupturing capacity of present circuit-breaker equipment were discussed. Some of the factors which have been found to make more satisfactory the operation of oil breakers are as follows:

- Vents on each tank piped to a common header.
- Individual vents on each tank.
- Reinforcing the tank.
- Rebuilding the operating mechanism.
- Increasing the operating speed.
- Use of the magnetic blow-out principle.
- Addition of more breaks.
- Use of increased amounts of oil in breaker tanks.
- Frequent changing or filtration of oil.

According to the reports rendered these various factors, used either singly or grouped, have resulted in better operations. Much discussion took place relative to the merits of these suggestions.

One oil for both switches and trans-

COMING PACIFIC COAST ELECTRICAL ASSOCIATION MEETINGS

Technical Section—
Conclave and Executive Meeting—San Joaquin Light & Power Building, Fresno, Calif.
March 25-27, 1925

Commercial Section—
Conclave and Executive Meeting—San Joaquin Light & Power Building, Fresno, Calif.
April 3-4, 1925

Pacific Coast Electrical Association—
Annual Meeting—San Francisco, Calif.
June 15, 1925

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formers was another subject which brought out much discussion From the point of view of the operating company, one common oil has proved to be entirely satisfactory and more economical. However, the manufacturers point out that the viscosity of circuit-breaker oil is double that of transformer oil and that the use of low-viscosity oil in breakers results in more splash and greater fire hazard. It was conceded that in most cases the advantages of the use of one common oil for both purposes more than offset the disadvantages.

Discussion on two-break versus multi-break switches showed a divergence of opinion and operating experience. Some claimed that multi-break switches were more efficacious, while the manufacturers pointed out the fact that this type had been tested exhaustively and experimented with and finally abandoned in favor of the improved two-break design. Operating experience of some companies was in support of this contention while others seemed to show that increasing the number of breaks was satisfactory. No definite conclusions were reached.

Transformer operating characteristics and application have received wide attention. The possibility of secondary explosion has been greatly reduced by the new development whereby all oxygen is removed from the tanks above the oil and replaced by inert gas. This is known as inertaire. None of these new transformers are now in service on the Pacific Coast, but some are on order.

Ration adjusters and heavy-duty tap changers have been used successfully on transformers of voltages up to 110 kv. where frequent changes are necessitated by changing conditions.

Temperature indicators, so located as to give the temperature of the hottest spot in the transformer coils, are the latest development along this line and are much more satisfactory than those registering the oil temperature. The design used by the General Electric Company is a coil which is wound in between the layers of one of the main coils. These are used even on 220-kv. transformers for they are placed on the low side. The hottest coil is always picked for this service so that the temperature indicated is that of the hottest coil. Load regulation by transformer temperature rather than by amperage was recommended by one delegate. Pressed-steel tanks for distribution transformers were decided to be better than cast iron from all points of view.

Oil purification by means of a centrifuge versus a lter press was discussed. The final consensus of opinion seemed to be that the use of the former for the removal of sludge and heavy material followed by the filter was the ideal combination as the filter press so quickly becomes clogged and does not remove all of the sludge.

An interesting test run by the Pacific Gas and Electric Company was described by H. A. Laidlaw of that company. A barrel of oil was selected and into this was put salt, shellac, and other impurities until the oil would stand no test whatever. The mixture was then put through the two processes separately to test the efficacy of each. It was found that one passage through the centrifuge brought the oil up to a 30,000-volt test while three passes through the filter press failed to bring it this high.

Frequency changers for power interchange in various parts of the country were discussed. The possible use of surplus capacity in these machines for power-factor correction was suggested. Some success along this line was reported by C. F. Benham, Great Western Power Company. Eastern applications of frequency changers permitting a frequency range up to four and one-half per cent were mentioned. Automatic induction regulators for permanent 60-kv. tie-in purposes were mentioned by Mr. Laidlaw.

Tap changing under heavy load conditions was briefly discussed as also were relay operation and testing practice and system calculating tables. Step-by-step tap changers have been made for service as heavy as 9,000 amp. at 250 volts and on 10,000-kva. high-tension banks. Discussion of the testing of only the relay equipment versus including the current transformer and circuit breaker brought out the obvious advantages of the latter. System calculating tables are more than worth their cost in the opinions of some while others claim that they do not always give the results desired.

Automatic substations, current-transformer design, and fire-fighting equipment were given consideration. Various types of current transformers are being experimented with, and the results of these tests will be studied. The use of carbon dioxide for fighting electrical fires in comparison with other retardents evoked various opinions.

Station electrical grounds and the wide divergence in operating practice with respect to grounds aroused spirited discussion. The general practice on the Pacific Coast seems to be the solidly grounding of neutrals, regardless of the fact that in many cases it is known that there are ground currents. Experience would seem to recommend that all metal equipment around the station should be grounded for the purpost of protecting the operators if for no other reasons. Some companies, however, do not ground meter cases. Objection to the Eastern practice of inserting a resistance in the ground leads was voiced mainly because of the undesirable effect of such a resistor upon relay operation in many cases. A comprehensive treatise upon station grounds was read by F. H. Mayer, Southern California Edison Company, and was later published in the Jan. 15, 1925 number of the Journal of Electricity.

Technical Section Meetings to Be Held in Fresno.—The executive and conclave meetings of all bureaus of the Technical Section, P.C.E.A., will be held in Fresno, Calif., March 25-27. All meetings will be held in the San Joaquin Light & Power Corporation Building. Headquarters will be at the Fresno Hotel. The schedule of meetings is as follows:

Schedule of Meetings.

BUREAU	Wed. Mar. 25	Thur. Mar. 26	Fri. Mar. 27
	a.m.	a.m.	a.m.
Hydraulic Power	10:00		
Underground Systems	10:00		
Meter	10:00	9:30	
Accident Prevention	10:00	9:30	
Overhead Systems	10:00	9:30	9:30
Apparatus		9:30	9:30
Inductive Interference			9:30
Prime Movers			9:30
Safety Rules			9:30
	p.m.	p.m.	p.m.
Executive Committee	6:30		4:00
General Meeting		8:00	

Book Reviews

CIRCUIT TROUBLES AND TESTING

By TERRELL CROFT, Consulting Engineer. Directing Engineer of the Terrell Croft Engineering Company. 212 pages, 237 illustrations. $2.50. McGraw-Hill Book Company, Inc., New York, N. Y.

In this work the author has succeeded in bringing together under one cover a large number of practical schemes for localizing and correcting faults and troubles which occur on light and power circuits. The text is written in the characteristically straightforward way of the author and the language used is such that it may be readily understood by the electricians, wiremen and troublemen who have to go out on the job and do the work. While it is obviously not a technical man's book, technical accuracy is not sacrificed in the plain-language style used throughout. Therefore the directions given should be of use to any man who wishes to obtain authentic practical information on these subjects. A total of 237 illustrations ably supplement the text.

The text is divided into six divisions and each division is conveniently subdivided to afford the proper segregation of subjects.

A thorough, but brief discussion of the various instruments and devices used in trouble testing is given in the first division. Different kinds of test-clips and leads, fuse testing devices, and test lamp sets are treated. Various kinds of battery and magneto test sets, resistance measuring devices and tone-test devices are described and the working principles of each explained.

The location of faults in multiple transmission and distribution circuits is taken up in the second division. Common terms are defined. Trouble manifestations are discussed and various means for determining the nature of the fault are suggested. Many different methods of making resistance and capacitance tests and the use of audible or tone-test methods for locating faults are described.

Interior wiring circuits and methods for tracing out open circuits, short circuits, grounds, etc., are covered in the third division. Series circuits with their peculiar varieties of troubles and methods for conveniently localizing these troubles form the subject matter of the fourth division.

Insulation resistance is the subject of the fifth division. Under this head is given the purpose of insulation and insulating materials in general together with a discussion of their properties and qualities. Ways and means of measuring insulation resistance, of locating and testing both high- and low-voltage defective insulators, and of locating tree leaks are given.

Polarity and its determination are questions which are always coming up in connection with emergency work in particular. These questions as well as devices and methods incident thereto are treated in the sixth division. Questions are given at the end of each section covering the material included in that section.

Meetings

"Elektrik-Nite" Entertainment Held at Salt Lake

One of the most successful "get-together" events ever conducted by the members of the electrical industry of the Intermountain section was "Elektrik-Nite," staged by the Rocky Mountain Electrical Cooperative League at the Elks Club at Salt Lake City on the evening of Feb. 26. The affair was in the nature of stag social and smoker and was attended by about 350 members of the electrical fraternity and their friends.

At the conclusion of the program refreshments were served. All branches of the industry were well represented, and the event was voted as one of the best of its kind that the electrical people of Salt Lake City and surrounding territory ever have conducted.

The affair was in charge of the entertainment committee of the league, consisting of W. A. Moser, branch manager of the Westinghouse Electric & Manufacturing Company, chairman; G. J. Guiver, of the Holding Electric Company, and J. V. Buckle, of the Buckle Electric Company.

Four Special Trains Will Bring Delegates to Convention

Reservations for transportation and hotel service for the forty-eighth convention of the National Electric Light Association to be held in San Francisco June 15-19 already are being made.

It is anticipated that at least 5,000 members and guests will attend the convention.

Hotel and transportation circulars were mailed to all members of the association on March 7.

The Convention Transportation Committee has urged all members and guests who contemplate attending the convention to make their reservations as soon as possible. This is necessary because of limited transportation facilities. The committee has reported that requests for accommodations on special trains will be honored in the order of their receipt. After the comfortable capacity of each special train has been filled the committee will be forced to decline other applications.

What is expected to be one of the most popular trains is the "Red Special," which will leave New York May 31 and stop over at various points of interest in Colorado, New Mexico, California and the Grand Canyon in Arizona, reaching San Francisco in time for the convention. After the convention the train will return over a northern route, stopping at Portland and Canadian points and reaching New York the last of June.

An extra fast train will be the "Blue Special," a duplicate of the famous "Broadway Limited." It will leave New York June 10 and reach San Francisco four days later. The "Green Special" will leave Chicago June 5 and embrace a nine-day sightseeing trip through Canada and Washington and Oregon, reaching San Francisco the night of June 13. An "Orange Special" leaving Chicago June 8 will make an abridgment of the "Green Special" itinerary and consume six days en route to California. Stopovers will be made at Spokane, Seattle and Portland.

Local power companies at the various stopovers will entertain members and guests on all special trains.

R. B. Grove, of the United Electric Light & Power Company, 130 East 15th Street, New York City, is eastern traffic manager, and G. H. Atkin, Electric Storage Battery Company, 613 Marquette Building, Chicago, Ill., is western traffic manager.

While hotel accommodations in San Francisco will be ample, C. E. Heise, chairman of the Hotel Committee, Room 527 Rialto Building, San Francisco, has requested that reservations be made as soon as possible. The hotel circular lists all of the principal San Francisco hotels with their rates.

Court Denies Condemnation Right for Transmission Line

Because the electric energy to be developed at the Baker River plant of the Puget Sound Power & Light Company in Skagit County, Wash., is not intended essentially for public use, the company cannot acquire land by condemnation proceedings as right-of-way for transmission lines, according to a decision handed down in Olympia March 6. The decision upheld the Snohomish superior court, which had denied the right-of-way sought.

COMING EVENTS

Commercial National Section, N.E.L.A.—
New York, N. Y.
March 17-19, 1925

Southwestern Public Service Association—
Annual Convention—Rice Hotel, Houston, Texas
May 5-8, 1925

Electrical Supply Jobbers' Association—
Annual Convention—Hot Springs, Va.
June 1-6, 1925

Associated Manufacturers of Electrical Supplies—
Annual Meeting—Hot Springs, Va.
June 8-13, 1925

National Electric Light Association—
Annual Convention—San Francisco, Calif.
June 15-19, 1925

The trial court denied the condemnation order on the ground that the power company now has a surplus of approximately 23,000 hp. from plants already in operation and that a large part of the 18,000 hp. expected to be developed on Baker River would be diverted to uses other than public.

The company brought the case to the supreme court on a writ of review after condemnation proceedings had failed to secure easements over certain lands, the utility having been unsuccessful in negotiations with the owners.

Plans for Camp Cooperation V Made.—The dates for the fourth annual conference of representatives of local cooperative electrical organizations, to be known as Camp Cooperation V, have been settled. This conference will again be held at Association Island, Henderson Harbor, N. Y., Sept. 8-12. The capacity of the island is limited, and as heretofore, it will be necessary to restrict invitations to duly accredited representatives of leagues now functioning and those interested in the formation of such organizations.

New Executives Are Installed by Los Angeles Club

At the regular weekly meeting of The Electric Club of Los Angeles, held March 2, the officers for the past year retired from office and those for the ensuing year were installed by R. H. Ballard, vice-president and general manager of the Southern California Edison Company. The new officers of the club are as follows:

J. E. Macdonald, president; manager Joint Pole Committee; B. G. Wright, manager Los Angeles office Southern California Telephone Company; B. F. Pearson, manager of operations, Southern California Edison Company; S. E. Gates, Los Angeles manager General Electric Company, vice-presidents. R. J. McHugh, secretary-treasurer, manager Garnett Young & Company; R. H. Manahan, city electrician; J. G. Loomer, industrial sales engineer, Western Electric Company, sergeant-at-arms.

Members of the executive committee are as follows: G. E. Arbogast, president, Newbery Electric Coorporation; H. L. Harper, manager Western Electric Company; L. E. Moselle, chief clerk commercial department, Bureau of Power and Light; H. E. Sherman, Jr., vice-president and sales manager, Illinois Electric Company; W. L. Frost, manager, commercial department, Southern California Edison Company; K. E. Van Kuran, district manager Westinghouse Electric & Manufacturing Company. W. A. Knost has been reinstalled as executive secretary.

Attendance Shows Nela Lighting Courses Popular

The increasing popularity of the lighting courses given by the engineering department of the National Lamp Works of the General Electric Company at the Nela School of Lighting, Nela Park, Cleveland, is evidenced by the fact that eighty-seven men representing central stations, electrical jobber and dealer organizations, fixture manufacturers, and other branches of the industry were enrolled in the twelfth illumination course held during the week of Feb. 9-13. The course covered intensive training in illumination fundamentals, practical problems in light designs and layouts, and the presentation of the commercial aspects of the various lighting fields by national authorities, with inspection trips to different laboratories and departments of the lamp works and to other industrial plants for practical demonstrations.

Plans are already under way for the thirteenth illumination course, which will be given during the week June 8-12 of this year.

A new activity of the Nela School of Lighting was the home lighting course for women in the electrical industry. It was given Feb. 2-5, 1925, and was attended by twenty-three women. "The Story of Light and Vision," "Results of a Residence Lighting Survey," "Wiring the Home for Good Illumination," Facts About Incandescent Lamps," were among the subjects covered, while light and color, artistic fixtures, portable lamps, home lighting problems and many other kindred topics were discussed. Demonstrations and inspection trips were interesting features of the course. A second course in home lighting is scheduled for Oct. 12-16, 1925.

Personals

M. W. Birkett, vice-president and general manager of The Washington Water Power Company, Spokane, was recently elected to the board of trustees of that company, succeeding J. P. M. Richards, deceased. Mr. Birkett's advancement with the Washington utility has been rapid since he joined that organization in 1908 as a clerk in the transmission division of the light and power department. Within a comparatively few years he had advanced to the position of assistant superintendent of light and power. He was made assistant to the general manager of the company in 1918 and a year later was promoted to become assistant general manager. Late in 1921, when W. E. Coman resigned as vice-president and and general manager, Mr. Birkett was made acting general manager, and the following year he received the permanent appointnment. Since then he has been vice-president and in February of this year he was elected to the board of trustees. Mr. Birkett is a graduate of the University of Wisconsin.

M. W. BIRKETT

W. S. Greenfield, president of Allied Industries, Inc., San Francisco, recently spent several days in Los Angeles on business for his company.

R. D. Thomas, resident engineer of Curtis Lighting, Inc., Denver, has moved his office from 1073 Broadway to 209 Ideal Building.

Frank R. Jamison is now handling the advertising and publicity of the Public Service Company of Colorado at Denver since the death of **George W. Bixler.**

Leo Dorner, formerly of the firm of Nollenberger & Dorner, Denver, was a recent visitor in California.

John C. Brown, county surveyor of Weber County, Utah, has been elected president of the Ogden chapter of the American Association of Engineers, succeeding **C. W. Cross. E. E. Kidder, Ernest Gilgen, Arthur Grix** and **H. F. Irwin** were chosen vice-president, secretary, assistant secretary and treasurer, respectively. **Ora Bundy, B. J. Finch** and **B. W. Matteson** were named directors.

W. D. Ryan, director of illumination, General Electric Company, Schenectady, N. Y., was a recent visitor in San Francisco, where he was appointed to serve as illuminating engineer by the Down Town Association in its campaign to have a uniform style of poles and electroliers throughout the city. After his conference with the officials of the organization, he proceeded to Mexico with the association's trade tour, but will return to San Francisco to serve with that body for the remainder of the year.

H. R. Ellis, treasurer, Merchants Heat & Light Company, Indianapolis, Ind., was a recent visitor in San Francisco.

P. J. Aaron, Seattle dealer in electrical supplies, lately made a trip to San Francisco.

C. M. Will, electrical dealers of Portland, paid a visit to San Francisco a short while ago.

Harry Byrne, of the North Coast Electric Company, Seattle, lately made a trip to San Francisco.

Murray Bourne, of the San Joaquin Light & Power Corporation, Fresno, recently spent some time in San Francisco.

T. J. McGrath, superintendent, Hawaiian Electric Company, Ltd., Honolulu, Hawaii, arrived in San Francisco from the Islands a short while ago.

D. C. Lappin, of the Lappin Electric Company, Milwaukee, Wis., recently paid a visit to San Francisco.

H. L. Jackman, of the Western States Gas & Electric Company, Stockton, Calif., recently spent some time in San Francisco.

Harry Daley, sales manager of the Majestic Electric Appliance Company, San Francisco, has gone East on business connected with his firm.

F. E. Browne, representing the Peerless Insulated Wire & Cable Company, 90 West Street, New York City, has been touring the Pacific Coast in the interest of his company.

M. T. Wright, manager publicity department and director of broadcasting of the General Electric Company, Schenectady, was a recent visitor in Los Angeles, following his return from Honolulu.

J. H. Jamison, manager merchandising division, Los Angeles office of the Westinghouse Electric & Manufacturing Company, recently left on a month's trip to visit the appliance factory at Mansfield, Ohio, the main factory at East Pittsburgh and the New York office of that company. Mr. Jamison has gone East to secure the latest information on the manufacture and merchandising of electrical appliances.

W. A. Grove, for the past three years advertising representative of the Curtis Publishing Company, Philadelphia, has been appointed manager of advertising and sales promotion for the Edison Electric Appliance Company of Chicago.

C. D. Weiss, superintendent of shops, stores and transportation for the San Diego Consolidated Gas & Electric Company, was a recent visitor to Fresno where he attended the purchasing and stores meeting held there.

G. P. Baldwin, general manager merchandising department of the General Electric Company, with headquarters in Bridgeport, Conn., spent several days in Los Angeles recently in an inspection tour of the local territory.

James W. Lincoln, Lincoln Electric Company, Cleveland, paid a visit to San Francisco a short while ago.

P. D. McKee, vice-president and general manager of the California Oregon Power Company, Medford, Ore., and president of the Western Taxpayers' Association, accompanied by **W. H. Crawford**, manager of the new industries department of the same company, was a visitor in Salt Lake City recently attending a meeting of the Utah Taxpayers' Association.

J. W. Anderson, formerly sales manager of the Great Western Power Company in Sacramento, recently has resigned to become affiliated with the firm of Alexander & Lavenson Electrical Supply Company of San Francisco, with headquarters in Sacramento. Mr. Andderson will cover the Sacramento Valley.

A. C. Riggs, formerly line construction superintendent in the distribution department of the central district, Puget Sound Power & Light Company, Seattle, has been promoted to the position of superintendent of light and power of the northern district of that company, Bellingham, Wash., taking the place of **C. F. Terrell**, who was transferred to the El Paso Electric Company, El Paso, a Stone & Webster property.

C. C. Thomas has been appointed vice-president and **E. C. Macy**, general manager, respectively, of Dwight P. Robinson & Company, Inc., with offices in the Union Oil Building, Los Angeles.

T. P. Walker, formerly manager of the Baton Rouge Electric Company, has been made manager of the El Paso Electric Railway Company, succeeding A. H. Warren. Both companies are Stone & Webster properties. After graduating from the University of Nevada, Mr. Walker entered the employ of Stone & Webster at Reno and from there was transferred to the Boston office. After two years' active service in the army during the World War, he went to Haverhill, Mass., to become superintendent of the Haverhill Gas Light Company and later was made manager. In April, 1923, he took up the duties of manager of the Baton Rouge Electric Company which is a combined gas and electric utility. During his residence in the Louisiana city Mr. Walker took an active part in community affairs, having been, among other things, a member of the board of directors of the Chamber of Commerce. He was also a prominent member of the Rotary Club and the American Legion.

T. P. WALKER

P. M. Parry, commercial manager, and **E. L. Bourne**, manager of the advertising department, respectively, of the Utah Power & Light Company, Salt Lake City, were among the principal speakers at the annual banquet of the Boxelder Commercial Club held recently at Brigham City.

J. M. Curtin, manager industrial department Westinghouse Electric & Manufacturing Company, East Pittsburgh, recently spent a week in Los Angeles, going over the territory with the local district manager, **K. E. Van Kuanr** and the manager of the industrial division, **J. H. Fenton.**

Edward D. Lyman recently has become associated with the Westinghouse Electric & Manufacturing Company. He will serve as assistant to **Carl L. Burgess**, manager of the publicity division in the Los Angeles office.

W. C. Smith, of the San Francisco office of the General Electric Company, recently addressed Redwood Chapter of the American Association of Engineers at Eureka, Calif., following their monthly dinner at which thirty-five were present. His subject was, "Transformers."

Alba H. Warren, since 1918 manager of the El Paso Electric Railway Company, a Stone & Webster holding, has been made district manager of all properties in Georgia and Florida managed by Stone & Webster. Mr. Warren entered the employ of that organization in 1900, and since then has held a number of different positions with companies under its management, among them being assistant treasurer and later superintendent, Houghton County Traction Company, Houghton, Mich.; and manager Brockton & Plymouth Street Railway Company, Brockton, Mass., Pensacola Electric Company, Pensacola, Fla., and Galveston Electric Company, Galveston, Texas, respectively. The last named position he held prior to taking up his duties at El Paso. During his residence in that city Mr. Warren has taken an active part in civic affairs, and at the time of his departure was president of the El Paso Chamber of Commerce and the head of the Associated Charities. He left about Feb. 15 to enter upon his new work.

ALBA H. WARREN

Guy W. Talbot, president of the Pacific Power & Light Company, Portland, and **John S. Laing**, general attorney of the same company, were in San Francisco recently in connection with the purchase of the Northwestern Electric Company.

Karl von Hacht, until recently connected with the sales force of the Thomas Day Company, San Francisco, has been made resident manager of the company's Sacramento branch.

L. R. White, formerly new business superintendent for the Pacific Gas and Electric Company at Chico, is now a partner with **William Conery** in the Gas & Electric Service Company, 233 Broadway, that city.

Clarence Keeler recently has been appointed production manager of the new sign manufacturing shop established by the Public Service Company of Colorado at Denver.

L. B. Buckley was elected chairman of the Engineering Foundation, at the tenth annual meeting of the Foundation Board, succeeding **C. F. Rand. E. D. Adams** was elected first vice-chairman; **E. A. Sperry**, second vice-chairman; **J. S. Langthorn**, treasurer; **Henry Lardner**, assistant treasurer; **A. D. Flinn**, director and secretary.

Mrs. W. B. Kohlwey, formerly of the Kohlwey-Smith Electric Company, San Francisco, is now office manager for the Wilson Electric Company of that city.

J. C. Hamilton, chief clerk at Pendleton, Ore., for the Pacific Power & Light Company, has been promoted to district manager at Sunnyside, Wash., taking the place of **Fred Florine**, who is retiring on account of ill health. **Clement Shafer**, chief clerk of the gas department at Lewiston, Ida., succeeds Mr. Hamilton.

A. E. Holloway, superintendent commercial department, San Diego Consolidated Gas & Electric Company and president of the Chamber of Commerce, **W. F. Raber**, general manager of the power company, and **Carl Heilbron**, president of the Southern Electrical Company, were members of the delegation of San Diegans who made a recent excursion to Yuma, Ariz., to celebrate the opening of the new coast-to-coast highway.

H. H. Watson, superintendent of construction for the Byllesby Engineering & Manufacturing Corporation in San Diego, recently returned from a business trip to Chicago. He stopped over en route at Minneapolis where he visited **H. H. Jones**, vice-president in charge of operations for the Northern States Power Company.

George F. Phythian, construction superintendent for the Byllesby Engineering & Management Corporation, is now in Salinas, Calif., to take charge of the major construction program of the Coast Valleys Gas & Electric Company for 1925. He recently completed the installation of a steam electric generating plant for the Mountain States Power Company at Marsfield, Ore., another Byllesby property.

R. C. Stackhouse, manager switchboard department Los Angeles division of the Westinghouse Electric & Manufacturing Company, was a recent visitor at the Pittsburgh office of the company, as well as other Eastern Westinghouse plants.

Albert I. Appleton, Appleton Electric Company, Chicago, recently spent some time in San Francisco.

H. W. Brundige, president of the Railroad Commission of the State of California in 1921 and 1922, again has been appointed to that important post. His career as a newspaperman also has made him well known, particularly in the southern part of the state. For over twenty-five years he has been identified with the newspapers of Los Angeles, having arrived in that city in 1897 to assume the position of city editor of the Los Angeles Record. After a short sojourn in Portland as city editor of the Portland Telegram, he returned to Los Angeles to become managing editor of the Evening Express. He was editor-in-chief of that paper and of the Morning Tribune and assistant publisher until his appointment to the Railroad Commission Jan. 1, 1919. In his capacity as private citizen he always has taken an active part in municipal affairs and has been instrumental in assisting the city of Los Angeles to accomplish many of its most important civic projects. In his official position as president of the Railroad Commission he has done much to bring about amicable settlements of controversies involved municipalities, public utilities, irrigation and other utility districts. Mr. Brundige was born in Kingston, Ohio, in 1865, and completed his education at Park College, Parkville, Mo., and the Ohio State Normal School, Ada, Ohio.

H. W. BRUNDIGE

J. T. Keleher, formerly of the Mine & Smelter Supply Company of Denver, is now associated with the B. & R. Electrical Supply Company of that city.

A. E. Wishon, vice-president and general manager of the San Joaquin Light & Power Corporation, Fresno, was a recent visitor in San Francisco.

Obituary

Thomas F. Burke, electrician in various San Francisco theaters for a number of years, died suddenly in that city Feb. 28.

Dr. Saitaro Ohi, one of Japan's pioneer electrical engineers and at one time president of the Institute of Electrical Engineers of Japan, died at his home recently.

TRADE NOTES

The Trumbull Electric Manufacturing Company, Plainville, Conn., recently has issued its 1925 Catalog No. 13, which is complete and supersedes Catalog No. 12, Safety Switch Bulletin No. 5 and all supplements thereto, and Panel Board Bulletins Nos. 1, 2 and 3. The book contains 195 pages, is well printed on heavy glazed paper, generously illustrated with halftones and line cuts, and it brings under one cover up-to-date listings on all Trumbull lines. It is divided into four sections: Section I, safety switches; II, open knife switches and accessories; III, porcelain wiring devices; IV, panel boards and cabinets. The last pages are devoted to telegraphic code and indexes. A colored insert is placed at the beginning of each section for convenience in locating them. The catalog is now ready for local distribution upon request.

The Hart & Hegeman Manufacturing Company, Hartford, Conn., is announcing its new H & H square handle tumbler switch. This line is made in single pole, double pole, three and four-way switches in both shallow composition and porcelain bases. The same line is made with radio luminous jewel in the operating lever and also in the lock type.

The Uehling Instrument Company, Paterson, N. J., has issued recently Bulletin No. 118 on its Apex CO_2 recorder and Bulletin 118-A on the Apex pneumatic CO_2 meter.

The National Lamp Works of the General Electric Company, Nela Park, Cleveland, has announced the establishment of three new sales divisions, namely, southern lamp division, southwestern lamp division and northern lamp division, with general offices at Atlanta, Ga., Kansas City, Mo., and Minneapolis, Minn., respectively. The Banner electric division, Youngstown, Ohio, and Colonial electric division at Pittsburgh, Pa., have been consolidated with general offices at Pittsburgh and will be known as the Allegheny lamp division.

Dahl Electric Company, San Francisco, has opened a branch in the Crystal Palace Market, that city.

The National Radio Company, Seattle, has opened a new retail radio store at 112 Stewart Street, its personnel consisting of George W. Cleveland, Jr., C. R. Closser and H. C. Perkins, the latter to be general manager of the company.

Western Electric Company, San Francisco, announces that it is actively taking up the sale of the complete line of Majestic air heaters, including their heavy duty lines, and is prepared with stocks to serve the trade.

The Lionel Corporation, New York, is celebrating its silver jubilee, the first models of miniature electric trains and railroad accessories first having been introduced in 1900. In commemoration of the anniversary many new models have been added to the line.

Packard Electric Company, Warren, Ohio, has issued Bulletin 200-A, which covers a complete line of distribution transformers.

The Williamson Electric Company, 1414 Fourth Avenue, Seattle, has been purchased by J. P. Drew and B. P. Warren, following the retirement of H. E. Williamson from the firm. Both new owners are well known in local radio and broadcasting circles.

The Edeson Electric Company, Seattle, has purchased the **Coliseum Cut-Price Radio Shop,** 504 Pike Street. The Edeson company has been a pioneer in radio work at its store at 1120 First Avenue, which will be continued. The firm has established New York representation, through which direct contact is maintained with the newest radio developments and the best values.

The Robbins & Myers Company, Springfield, Ohio, has issued recently catalog No. 1243, which completely illustrates and describes its 1925 line of fans. It has also ready for distribution its dealer portfolio, which gives a complete layout of the dealer helps which the company is prepared to furnish for the 1925 season.

The Commercial Manufacturing & Supply Company of Denver is installing galvanizing equipment in order to accommodate new business necessitated by recent changes in the electrical ordinance in that city. Cabinets, switch boxes, panel boards and similar equipment are now being produced by the company.

The Roller-Smith Company of 233 Broadway, New York, announces the appointment of W. H. Pugh as its representative in the northeastern part of Pennsylvania with headquarters at its factory at Bethlehem, Pa. Mr. Pugh formerly represented the company in the territory immediately adjoining Bethlehem.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, has recently designed a new single-oven range of small and compact size, known as Junior Automatic Electric Range. The new design embodies all the features of other types of ranges, having a clock which automatically turns on the current, while a thermostat turns it off at any desired temperature. The oven is thoroughly insulated and is made of sheet steel and finished both inside and out with a heavy coat of blue vitreous enamel. It is heated with two 1,500-watt units of the open brick type and the three surface units, consisting of one 8-in. 1,500 watt, one 8-in. 1,000 watt, and one 6-in. 1,000 watt, are also of the open brick type. The ranges may be obtained in both black japanned and white vitreous enamel finish.

The Cutler-Hammer Manufacturing Company, Milwaukee, has recently completed a new device, known as the "Cutler-Hammer Radioloc Switch," a locking switch, which makes its possible to lock the radio set "off" when you leave it, protecting batteries from being run down and tubes burnt out. The switch, installed in the "A" battery circuit, also provides a convenient means of interrupting reception without loss of station, the set being "on" when the key is in the slot and always "off" when the key is removed. The device is easily installed, requiring only one hole in the panel.

General Electric Company, Schnectady, N. Y., has issued recently Bulletin No. 45,609, describing the general construction, principles of operation and exclusive features of its surface air cooler. The bulletin is a 10-page leaflet, well illustrated by photographs and drawings.

The Griscom-Russell Company, New York, has recently issued Bulletin No. 242 on the Russell U-Tube storage heater, for heating water in dyehouses, laundries, hotels, apartments and other places where the exhaust steam supply is limited. It can be obtained by addressing the company at 90 West Street, New York.

"Electrified History" depicting the reason for "King Arthur's Short" as interpreted by the Western Electric Company.

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Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES

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Discussion

ONE of the principal functions of a trade journal is that it furnish an open forum for its readers for the discussion of their particular problems. This does not mean that contributions must be in the form of signed articles. For the purpose of providing a section for the expression of the views of its readers the Journal of Electricity carries a department headed "Discussion." In it are published letters from readers expressing opinions of material carried in a preceding issue or taking exception to editorial opinions or the opinions of contributors.

The editors welcome contributions to this section. If a reader does not concur with the statements of the editors or a contributor, if an article or a news item calls to mind something of a related nature which he feels would be of interest to his associates, we hope that he will set down his opinions on paper and forward them to the editors. By so doing he will be performing a service to others in the industry.

The editors do not want any reader to feel that his contributions, suggestions or criticisms are not welcome, when as a matter of fact they are earnestly desired. Discussion is welcomed at all times.

EDITORIAL

Congratulations Due the Contractor-Dealers of California

ON Thursday, March 26 last, a meeting took place in the city of Los Angeles that marked a great step forward in the affairs of the electrical industry in California. On that day plans were perfected by which the Southern California Electrical Contractors' Association joined forces with their brethren in northern California whereby a statewide working organization of electrical contractors has come into existence for the first time in the history of the industry. The new body will be known as the California Electragists, affiliated with the Association of Electragists, International. Thus the Electragist movement is launched in real earnest in California, and it is not difficult to predict that the influence of the Electragist idea will mark a new era for electrical contracting in this state.

Too much credit cannot be given to the earnest hard-working men whose devotion and self-sacrifice have made this step possible. H. H. Walker, C. J. Geisbush, F. E. Elser and Frank McGinley of southern California, Victor Lemoge, Clyde Chamblin, H. H. Courtright and Walter F. Price of northern California, and many others have labored long and steadfastly in order to bring this coalition about.

We bespeak for the California Electragists the earnest support and hearty cooperation of the entire industry.

Specialization and the Executives of the Future

SINCE this is an age of specialization, where shall we get the executives of the future? This question may be expected to crop out at frequent intervals when men talk shop over the lunch table or at business conferences. The story will be told of the mechanic, so-called, who was applying for a job. When asked what his experience had been, he replied that he "had been drilling ⅝-in. holes in axle casings at the Ford factory," thus presenting a vivid picture of the mechanic of today.

There is the professor who spends a lifetime in the study of Greek infinitives, the central-station engineer who specializes on protection devices, and the countless others who concentrate all of their abilities upon some detail that forms merely a part of the whole. Where will they come from, and how are they being trained, the men who will see the picture in its entirety and be able to direct and coordinate the work of the countless specialists?

The engineer has been urged to make himself the man of the hour, to qualify himself to take executive responsibility, to be the boss instead of the hired man. But how can the specialist "unspecialize" his thinking? It is a difficult job indeed.

And here enters whom?—The lawyer, forsooth, the corporation attorney, whose practice is so general in contact with business and industrial problems of all kinds that he has become the general business practitioner who gives orders to the crew of specialists, the "Greek-root boys."

Who are the presidents of the Pacific Gas and Electric Company, the Great Western Power Company, the Portland Electric Power Company? Wigginton E. Creed, Guy C. Earl, and Franklin T. Griffith, respectively, all lawyers of note in their chosen profession who have made a success in solving the knotty problems of finance and business administration. E. H. Gary, chairman of the board of the United States Steel Corporation, is a lawyer, not a steel man.

What is the lesson for the young man about to enter college? Study law, young man, whether you expect to follow it forever or not. Apparently there is the top rung of the ladder awaiting you, if you train yourself for it, while the engineer would appear to be foredoomed to the part of hired man in the industrial scheme of things.

A Good Name and Great Riches

WHEN a man changes his name he is regarded with a certain amount of suspicion. One is inclined to infer that the name which he has abandoned is no longer an asset, that it has become a liability. It would seem reasonable to assume that the same rule might be applied with equal force to something inanimate—an article of commerce or a type of business establishment.

These few remarks are prompted by an attempt that now is being made by a publication issued in Chicago and purporting to be in the interests of the electrical industry to make a determined assault upon our old friends, the central station and the convenience outlet. It is alleged that these terms are not sufficiently descriptive of the functions of each and that through their use a certain amount of confusion is brought about in the minds of the general public when reference is made to the central station or to the convenience outlet. Possibly Californians may be somewhat sensitive as to any liberties taken with the convenience outlet, because, if our information is correct, this term was invented in California

and has been made to carry a real significance in the minds of the people through large expenditures of money, time and effort on the part of the electrical industry. We don't know the origin of the term central station, but assume that it was devised in order to set up a distinction between the generation of power for public service and that of isolated plants for a private consumer only.

Why is a horse? The word horse conveys a definite idea to all of us, not because the term is particularly descriptive but because a horse has always been a horse, at least for many thousands of years. Nevertheless, we have, as well, saw horses, clothes horses, horse radish, and for the benefit of the "high-brow" readers of this editorial, a geological occurrence known as a nintrusion of one mineral on another, which is also called a horse. Should we rob our old friend the horse of his good name merely because of the existence of these other kinds of horses and change his name perhaps to eohippus as being more neary descriptive? We hope not. Seriously the thought of calling the central station something else and doing the same thing with the convenience outlet would be like starting all over again to establish good will for these two very useful factors in our industrial life, and this without any compensating circumstances.

Power Companies in the Role of True Sportsmen

STEWART Edward White in a recent series of articles in a national publication calls attention to the fact that this is the time of year that the inveterate sportsman begins going over his duffle, taking stock of his hunting and fishing equipment in preparation for the coming of spring and the opening of the fishing season. This brings to mind the fact that the central stations of the West are doing their part in the conservation of fish and wild game generally.

Each year the power companies in California plant literally millions of trout fry in the streams of the watersheds in which their developments are located. One company receives an entire carload of fry every year that are transported first in trucks and then by pack-mule to the headwaters of nearby streams and planted for the enjoyment of sportsmen in future years. Another company planted many thousands of small fish in the lakes adjacent to one of its projects. Cooks in the construction camps fed the fish all one year and kept the lakes posted so that unscrupulous fishermen would not catch them before they had matured.

As a further illustration of the steps the companies are taking to conserve wild game, we quote from a national recreational magazine the following: "The Western States Gas & Electric Company deserves great credit for the splendid spirit of cooperation it has shown in protecting the deer in the high Sierras. A great many industrial enterprises would do well to take a lesson thereby." The deer in migrating from the higher elevations to their winter ranges encountered the company's canal, which was concrete-lined for about six miles. In attempting to jump the canal many deer were drowned. After consultation with the California Fish and Game Commission the company constructed an 8-ft. fence along this section of the canal with openings and bridges every 1,500 ft. This served to protect the animals and to reduce greatly the number of casualties.

The true sportsman will offer up a silent prayer and vote of thanks to the companies which are doing so much to conserve wild life in the mountains and to maintain the name which the West has held as "the sportsman's paradise."

Support Those Who Support Your Industry

ON another page of this issue there appears a story of a meeting of the newly organized electrical league formed by the electrical contractors and others in the North Bay district. The newly formed association selected a bank as the depository of its funds because it was completely equipped electrically. This is a commendable move on the league's part. If a bank or other organization is progressive and employs electricity in its many phases, why shouldn't it receive the patronage of the members of the electrical industry? Is there any better way to show appreciation?

DISCUSSION

Application of Portable Motors for Orchard Spray Pumps

To the Editor:

Sir—Mr. H. S. Vaile inquires as to the possibility of using portable electric motors in connection with portable spray pumps. He also wonders if it would be possible to spray with some type of "compressed air or small portable blowers," rather than piping to hydrants throughout the orchard. The following advantages and disadvantages have been pointed out for the stationary spray plants.

Advantages —

1. Spraying is not affected by soil conditions.
2. Pests that require quick action are speedily controlled.
3. Large orchards may be sprayed as effectively as small ones.
4. Convenience and saving in time and labor.
5. Long usefulness and low depreciation of equipment, a permanent improvement.
6. Spraying is possible with minimum danger of knocking or bruising the fruit on heavily laden branches.
7. Props do not prevent spraying.
8. Hillside orchards may be more easily sprayed.
9. Intercropping is possible.
10. Possibility of using electric power.

Disadvantages —

1. Initial cost.
2. All responsibility is on one plant.
3. Non-portability.
4. Possibility of spray material settling in pipes.
5. Upkeep and attention to numerous parts.
6. Possible damage to system during cultivation.
7. Possible loss by leakage.
8. Some spray material is wasted.
9. Slight loss in pressure due to friction.
10. Demand charge on electric motor.

It is evident that the main reason for installing piping systems in the orchard is to permit of spraying under very adverse conditions, without damage to trees or fruit. Frequently it is very difficult and sometimes impossible to draw a portable rig through the orchard because of either the sandy or muddy condition of the soil. Time is also an important element and it is felt by some that by being able to operate several nozzles at once, that the effect of the spray is greatly increased.

This question must not be looked at from the standpoint of one type of motor versus another; nor yet should it be looked at from the standpoint of one rig versus another, but must be considered from the standpoint of economy and efficiency. The writer is unable to give specific operating costs at this time, but tests are now in progress on the various California plants, and tabulations are being made which will be a guide to the cost of installation and operation.

Some type of atomizer similar to the air brush or spray gun used in washing automobiles may be developed, but up to the present time there are no available data on their operation. One manufacturer, at least, Puro Manufacturing Company, Charlottesville, is making investigations of the use of a steam atomizer, but here again the orchardist will be confronted with the necessity of pulling comparatively heavy machinery through the orchard. Uniformity of solution and convenience of mixing are pointed to by the users of stationary plants as being marked advantages.

I have been unable to locate any portable outfits that are equipped with a motor and cannot, therefore, back up my statements by figures.

The Committee on Relation of Electricity to Agriculture has the investigation of stationary spray plants as a definite project, and tabulations and reports should be available by the first of May.

B. D. MOSES,
Division of Agricultural Engineering,
University of California.

Davis, Calif.,
March 23, 1925.

Larger Allowances for Fixtures Needed in House Specifications

To the Editor:

Sir: I am enclosing a copy of a letter that I have mailed to a large group of architects and contractor-builders devoting their time to the designing and erecting of homes in the West. The letter is being sent with the hope that the architect and builder may be informed of the present inadequacy of the allowances for fixtures that are made in the average home specifications.

I feel that, through the failure of the architects and builders who are responsible for the making of allowances for fixtures many homes have been furnished with lighting fixtures which are below the standard of the rest of the house, with the result that the entire appearance has been marred. To advise the architects and builders of the importance of adequate allowances for the lighting fixtures in the house is the duty of the entire electrical industry.

Contact with the architects and builders who are responsible for the erection of homes in the West is necessary. It is also imperative that whenever the opportunity presents itself every man in the electrical industry must impress upon the architect and contractor-builder the importance of adequate allowances for all classes of electrical installations in the new homes of the country.

I feel that every time the allowance for wiring or fixtures is too low, the entire electrical industry suffers. The home-owner, relying upon the judgment of the architect, concludes that the cost of adequate electrical equipment is too high and either installs cheaper and less electrical equipment or orders the material his house requires and feels that the electrical industry is robbing him.

What is needed is the education of those responsible for the designing of the homes of the West. It is up to the electrical industry to do the educating.

B. J. WILDMAN,
Pacific Coast Manager,
Moe-Bridges Company.

San Francisco,
March 19, 1925.

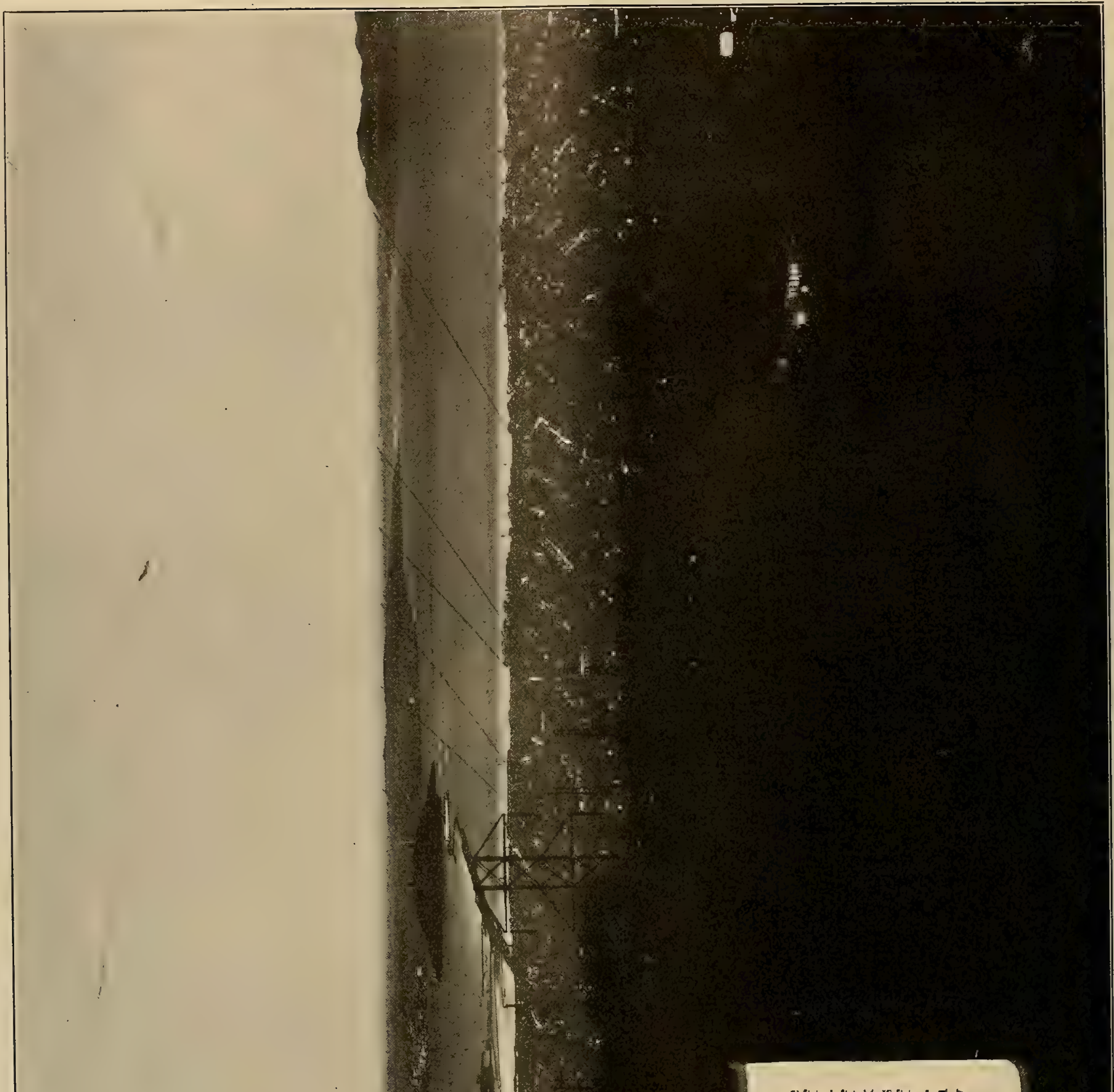
Editor's Note.—Mr. Wildman's letter to the architects and contractor-builders reads as follows:

"Architects and contractor-builders do not seem to realize the full sales value of attractive lighting fixtures. They are the only permanent decorative feature of the home. Either for re-sale or renting no other feature will contribute so much as attractive lighting fixtures. A contractor once told the writer he made more money on the fixtures of his houses than on any other one item, because he invested enough in them to enhance the value of everything else.

"In spite of this fact there seems to have grown up a custom among some architects and builders to make an allowance for fixtures, an allowance wholly inadequate, with the result that the real buyer of the fixture loses faith in both the architect and the fixture dealer. He discovers that $40 is not enough for a five-room bungalow, nor $100 for a $10,000-home. To make such an allowance is like recommending a rag carpet for the living room. If an allowance at all is made it should be for at least 3% of the cost of the house.

"As we say, the custom seems to have become quite prevalent. In fact, upon a recent tour through the main centers on the Pacific Coast, during which I called on an innumerable number of electrical dealers, large and small, and attended several conventions, I made inquiry as to the outstanding weakness of the lighting fixture business. Almost to a man they agreed that the custom of architects and builders in making an allowance for fixtures was destructive to the best interest of the industry. The trouble lies not in making an allowance, but in making an allowance wholly inadequate.

"May we ask that you think it over, keeping in mind that in making an allowance that is not adequate the judgment of the architect and builder is subject to criticism, and likewise that in cheapening any phase of the electrical industry you cheapen it all."



SAN FRANCISCO, scene of the forty-eighth annual convention of the National Electric Light Association to be held during the week of June 15, as seen from the hills back of Berkeley. The steel tower line is part of the transmission system of the Pacific Gas and Electric Company. In the right background is the Golden Gate while the dark blotch in the bay is Goat Island.

Age Limits and Physical Examination of Employees

By a Special Subcommittee of the "Tacoma Foremen's Conference"

Puget Sound Power & Light Company, Southwestern Division, Tacoma, Wash.

THE "Tacoma Foremen's Conference" is a monthly meeting of the superintendents of departments of the Southwestern Division of the Puget Sound Power & Light Company and its electric railway subsidiaries having headquarters in Tacoma, Wash. Among the subjects recently considered by the conference were those of age limits and physical examinations for employees, and the report issued by the subcommittee formed to investigate the subjects is so comprehensive that it is published here for the benefit of other companies interested in studying the inter-relation between the management, the employee and the public.

TO investigate the advisability of establishing a standard practice in regard to age limits of new employees in the various departments of the Puget Sound Power & Light Company, and of making a standard physical examination a condition of employment in all departments; after such investigation, to make definite recommendations on these two subjects—these were the objects of the special subcommittee appointed at the sixth meeting of the "Tacoma Foremen's Conference" held Sept. 19, 1924. This committee consisted of H. J. Nason, roadmaster of the Puget Sound Electric Railway Company, chairman; F. S. Hoffman, T. F. Marsh, H. A. Ritter, C. A. Miller and L. O. Granstrom.

History of the Subject

It seems fitting at this point to present a brief outline of the history of age limits and physical examinations in industry, inasmuch as the experience of others has guided this committee to some extent in their consideration of the problem. So much work has been done in this field that no examination of the subject, however brief, would be adequate without a reference to its history.

It has been fairly uniform practice for a good many years throughout industry in general and the more hazardous industries in particular to limit the age below and above which new employees are taken into service. Legal restrictions and responsibilities have established pretty definitely the lower limit at the age of majority. The upper limit has varied from thirty, which is now the rule on the western lines of the Chicago, Milwaukee & St. Paul Railway for inexperienced section foremen and bridgemen, to fifty. There are, of course, many industrial concerns which have no age requirements, but by far the most common practice among the larger firms is to hire only men between the ages of twenty-one and forty-five.

The history of physical examination in industry is by no means so settled, nor are the present practices so uniform.

Physical examinations were introduced into industry in 1909 by a few of the larger industrial corporations in the East. The sole object at that time was to eliminate those workers whose defects rendered them dangerous to themselves, to others, or to property. The men who had charge of the introduction of this work, having no precedent to guide them other than the experience of the railroads and certain extra-hazardous industries which had for some time examined their men for special requirements, turned to the life insurance companies and based the examination on their standards and general medical practice.

The result of this procedure was found to be an undue emphasis on elimination. The examinations were not based on the requirements of the work and, as a consequence, were in nearly all cases too stringent. Soon it was felt that some uniform system of examination which would meet the requirements of the job was needed. To meet this need there was organized in 1914 the Conference Board of Physicians in Industry.

This board is composed of the medical directors of a large number of prominent industrial corporations. A partial list of these shows the standing of this board: Philadelphia Electric Company, The Norton Company, American Thread Company, International Harvester Company, Cadillac Motor Car Company, Westinghouse Electric & Manufacturing Company, New York Edison Company, Yale & Towne Manufacturing Company, Hood Rubber Company, Eastman Kodak Company, and American Telephone & Telegraph Company.

In 1915 this board, representing 24 large factories, established examination standards and defined different degrees of physical defects. This resulted in a marked improvement in conditions until the general rejection percentage fell to ten, according to a survey conducted in 1918.

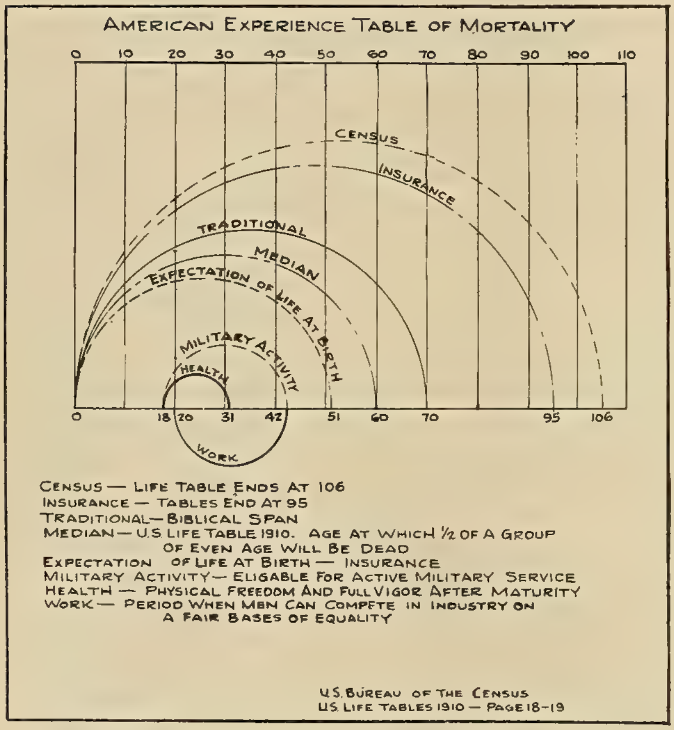
This percentage was considered still too high, and steps were taken to adjust the examinations more perfectly to the requirements of the job, until in 1920 an investigation of thirty-four plants, representing fifteen separate industries and a force of 410,106 men, showed a rejection percentage of only 4.6.

Meantime the attitude of the employers had been changing so that the objects of the examinations

were not primarily to eliminate the dangerous worker but to place the subnormal applicant in work suited to his capacity. Some concerns have been able to reduce their rejection percentage to the surprisingly low figure of 1.8.

The experience of thirteen years has shown that the tendency is to reduce the standards of rejection. Also it has shown unquestionably that physical examination is worth while. J. W. Schereschewsky, surgeon, in a report called "Physical Examination of Workers," in Public Health Reports, Vol. 29, No. 47, issued by the U. S. Public Health Service, has this to say:

"The question which inevitably arises is: will it pay? The answer must be unhesitatingly in the affirmative. The experience of all plants in which such systems have been put in operation is so satisfactory that no doubt has arisen in the minds of their officers that medical supervision does pay in increased efficiency of the working force, greater



American experience table of mortality showing various established life curves.

content of the workers, greater cooperation between employers and employed, and in greatly diminished loss of time and suffering from preventable disease."

Age Limits

The principal arguments for establishing age limits are two:

1. The employers and the workmen are protected against inefficiency and hazard that result from the presence in industry of workmen too young to be responsible or too old to be capable.

2. The employer is enabled to build up an organization that will not become a liability in the future. It is the universal desire among the employers of labor to secure and maintain a stable and at the same time efficient personnel. Experience has shown that the way to do this is to select employees old enough to be responsible and young enough to be able to give their best efforts in return for an adequate wage and fair treatment. Such men become efficient at the tasks assigned to them so that after ten years or twenty years they are still able to compete on a favorable basis with younger men who have not had the advantage of their experience.

It is fitting at this point to call attention to a chart called the "American Experience Table of Mortality," which is prepared by the U. S. Bureau of the Census. It is found on pages 18 and 19 of the "U. S. Life Tables," 1910. This chart of course is based on averages, and consists of a series of curves on a plan representing the various years of life from birth to 110 years. The first curve, the census curve, is based on the census life tables, which end at 106 years. The insurance curve is based on standard insurance tables which end at 95. The traditional curve represents the Biblical age of man, three score years and ten. The median curve ends at 60 years, which is the age at which experience shows one-half a group of even age will be dead. The expectation-of-life-at-birth curve is the common insurance figure of 51 years.

Period of Greatest Usefulness

The last three curves are significant for the purpose of this discussion. The military-activity curve begins at 18 years and ends at 42. These are the limits between which a man is eligible for active military service. It will be noted that this corresponds closely with industrial experience. The health curve, which is rather startling in comparison with the others, extends from 18 years to 31, and represents the best years, physically, of mature life. The work curve, below the lower line of the chart, extends from 20 years to 42, and represents the period when men can compete in industry on a fair basis of equality.

It may be argued against these figures that they have no practical application to the affairs of any one industrial plant. They represent averages, however, and they are based on experience. They are accordingly worthy of attention when the subject of age limits in industry is under discussion.

The principal argument against the establishment of age limits is that it discriminates unfairly against elder men, many of whom are out of work by reason of industrial changes, business depression, or any economic cause over which they have no control. Whatever merit there is in this argument is a reflection on the adjustment or maladjustment between the demand and supply of labor. This is a very vital problem at all times in this country as a whole, and at certain times in every industrial plant. Its solution, however, is beyond the scope of this discussion, and does not depend in any essential way on the matter of age limits.

Another argument against setting age limits is that at certain times they may operate as a handicap in securing labor. The answer, of course, is that emergency demands call for emergency methods and that at such periods it is quite possible to modify the rule.

Physical Examinations

The original and still important argument in favor of physical examinations has been stated before in this paper. Its phraseology has become classic: "Physical examination eliminates those workers whose defects render them dangerous to themselves, to others, or to property." This results in

1. Reduction of accidents and absenteeism,
2. Prevention of the spread of contagious disease, and
3. Improvement in morale.

A concrete, and for the purpose of this discussion, an important eample of this argument is furnished by the transportation business. The public has a right to expect that all men who are responsible for its safety shall be physically fit to discharge their duties safely. It is therefore the duty of the employer to provide such men. If he allows a man to handle the public when he knows that the man is liable to an attack of any sort that would render him incapable of performing his duties, that employer is criminally negligent. Further, if through ignorance he allows such man to work, he is no less criminally negligent. He has no right to assume that his men are physically fit; it is his business to know. Such knowledge can be gained only by a physical examination at the time of employment and subsequent examinations at regular intervals.

From the worker's point of view, physical examination with the consequent attention brought to bear on his physical condition will result in less time lost, better health, and the checking of many preventable chronic ailments.

Arguments Against Examinations

The stock arguments against physical examination are that they are embarrassing and unnecessary, and that they can be used and have been used by some employers to discriminate against certain workers. The answer to this argument is that the day of the unscrupulous employer of labor is on the wane, if not already gone.

Another objection to physical examination demands more consideration. It has been argued with some logic and much heat that the introduction of a system of physical examination will disqualify at once a certain percentage of present employees, some or all of whom are otherwise efficient, loyal and satisfactory. There is no question but that this objection is the hardest one for a proponent of physical examination to meet, since in any extreme case it would be true that an otherwise satisfactory employee might be disqualified from doing the particular work that he was doing at the time of the examination. The practical solution of the difficulty is the recognition on the part of the employer of a certain measure of responsibility in such cases. This usually takes the form of a transfer of the employee to other work where his defect will not debar him.

One other objection might be mentioned—expense. Physical examinations, particularly periodic ones, cost money. The expense, however, need not be prohibitive, if suitable forms are provided and fair relations are established with the medical force. There are very few cases on record of concerns giving up physical examination on the ground of expense. The uniform practice is, of course, that the expense is borne by the employer.

The records of the introduction of physical examination throughout the country show that the objections to the practice are not insurmountable. It all depends on how the matter is presented to the men. If they are shown wherein they will be benefited, and that their rights will be amply protected, they usually adopt the plan without hesitation. They must be "sold" on it, however, and the time and effort spent in "selling" them is well worth while.

To sum up the situation, it may be stated confidently that there is a very strong case in favor of physical examination in industry. It should be borne in mind, however, that there is still much pioneer work to be done, especially in the western part of the country, and that a uniform system in all departments of a company is still far from common.

Recommendations

This committee has considered both sides of these matters from many angles, and wishes to make the following recommendations:

I. For the purpose of this report a "permanent employee" shall be considered to be one who has been in service thirty days or more.

II. Age limits for new employees in all departments of the company should be

1. 21 to 35 for inexperienced men, and
2. 21 to 45 for experienced men.
3. Applicants under 21 and over 45 may be hired for special or part-time work at the discretion of the department head. In such cases the latter should be able to justify to the management his departure from the rule.

III. A standard physical examination should be a condition of employment in all departments of the company.

1. This should be a careful and exhaustive examination given by a competent licensed physician designated by the company.
2. Licensed physicians should be designated by the company at various points for the convenience of applicants.
3. This examination should be given after the applicant has been accepted for employment and before he goes to work.
    (a) It may be omitted in cases of temporary employment. At the end of thirty days the employee automatically becomes permanent and then should be examined.
4. At the time of this examination the doctor should furnish the applicant with advice regarding his physical condition and a copy of the examination if the applicant so desires.
    (a) This does not include treatments of any sort.

IV. A committee should be appointed to confer with the company doctor or doctors with a view to drawing up a suitable form of examination.

1. The examination in use at the present time by the Employees' Beneficial Association is considered unsuited to the requirements of this work.

V. Every employee should be re-examined periodically, preferably once a year.

VI. Each department head should work out in connection with the company doctor a schedule of disqualifying defects for his own department.

1. This schedule should serve as a bar to employment in that department only.
2. This schedule should be very carefully drawn with a view not to discourage employment, but merely to protect the company from the acts of a workman whose physical condition is a menace to himself, to others or to property.
3. Upon the return of an applicant's examinaation from the doctor, the head of the department should check it against this schedule and if none of the disqualifying defects appear, the applicant should be put to work.
4. Whenever the head of a department rejects an applicant for failure to meet the standards of the department, he should furnish the applicant with a copy of his examination as a public health service.
5. The following defects should disqualify a man from employment in any department:
   (a) any communicable disease,
   (b) venereal disease,
   (c) acute Bright's disease.

VII. The company should pay the cost of all examinations.

VIII. The initial examination should be used also for the Employees' Beneficial Association, and all new employees should be urged to join this organization.

IX. In cases of transfer of an employee from one department to another, and in cases where an employee is subject to call for occasional or part-time work in another department, the head of each department should have a copy of the employee's latest examination.

1. The employee's physical fitness for the new work should be determined according to the standards of that department.

X. In case an employee leaves the service for reasons other than physical disqualification, and presents himself within a year for re-employment, he may be taken in without examination.

1. He should be re-examined on his next regular date as though he had not been out of service at all.

XI. All present employees should be examined as a matter of record.

1. In case a present employee is found to have a disqualifying defect, the following procedure is recommended:
   (a) The employee should be examined by two other competent licensed physicians.
   (b) If the findings agree, the head of his department should transfer him to other work in the same department, if possible.
   (c) If this is impracticable, his case should be referred to a board to consist of representatives of the employees and the management.
      1. This board should be under the direction of the personnel officer.
      2. It should be empowered to submit a recommendation to the manager as to the equitable disposition of the case.

XII. All physical examination records should be kept in a centrally located file.

1. The head of each department should have records of the men in his department available at all times.
2. With this exception these records should be considered strictly confidential.

XIII. A plan should be worked out before the inauguration of this program that will provide for its presentation to all employees in such a way as to secure their full cooperation.

1. As a detail of this plan, the heads of departments should submit to examination first, the foremen second, and the men last.

New Method of Financing Electric Homes Adopted in San Diego

A new plan for the financing of a model electric home for display purposes has been adopted by the electrical industry of San Diego. The electric home is being sponsored by the electric club of the city.

The plan as adopted in San Diego was found to be effective when tried in Tulsa, Okla., and entails the cooperation of the Junior Chamber of Commerce of San Diego. This organization is to finance the building of the home through the sale of tickets, which will provide admission to the home. The Junior Chamber of Commerce will sell the tickets and use the proceeds to send delegates to a national convention. It is expected that the proceeds also will cover the cost of erecting the home.

After the home has been on display for two weeks it will be awarded to some contributor to the fund in the same manner that automobiles are awarded at fairs. The responsibility for the underwriting of the costs of the home has been accepted by the commercial organization.

The electric club will provide the electrical equipment in the home and will be responsible for the exhibition of the display after it has been completed. A full line of electrical devices will be installed in the home which is to be wired for complete electrification. Work has been started on the erection of the home which will cost about $12,500.

America's Highest-Head Hydro Plant to Be Built on Kings River

ERECTION of a hydroelectric power plant which will operate under the highest head of any plant in America is to be started in the near future by the San Joaquin Light & Power Corporation. This development is the Balch plant, which is to be erected on the Kings River in central California and will be the first unit of a series of hydroelectric plants to be placed on that river by the utility. The original installation in the Balch plant will have a generaing capacity of 28,250 kw., and provisions will be made for the addition of five units.

A hydroelectric power plant to be operated under an ultimate static head of 2,470 ft.—a head greater than that of any plant now developing electricity in America—soon will be in process of construction by the San Joaquin Light & Power Corporation, Fresno, Calif. The announcement made March 26 by A. Emory Wishon, vice-president and general manager of the company, that official sanction had been given to the erection of the Balch plant on the Kings River in central California forecasts the eventual fulfillment of the San Joaguin company's plans for a chain of hydroelectric plants on that river. The Kings River project, as outlined by the company, contemplates an expenditure of $50,000,000 in the development of power. The first plant, named in honor of A. C. Balch, one of the pioneers of the San Joaquin company, will be the biggest construction undertaking of the company since the erection of the Kerckhoff plant on the San Joaquin River. Jan. 1, 1927, is the date set for placing the plant in operation.

Engineering plans and preliminary details are practically complete. About $1,500,000 and five years' time have been spent in preliminary surveys, road building and in erecting a tower line to supply the construction camps with electric power. A short stretch of road remains to be completed between Balch Camp and the power-house site. It is expected that as soon as this is completed materials will begin arriving at the job so that actual construction work on the plant may be started.

H. K. Fox, who will be construction superintendent, has been the chief engineer of the project for several years and is thoroughly familiar with every detail incident to the construction of this string of plants. This fact is one of the salient reasons why there will be no delay in getting the project actively under way. In fact, Mr. Fox when interviewed stated that "work started at 8 o'clock the morning of March 26."

Highest Head in America

The Balch plant will operate under an ultimate static head of 2,470 ft., which will establish a new American record. There are, however, plants in the Swiss Alps with heads almost twice that planned for the Balch plant.

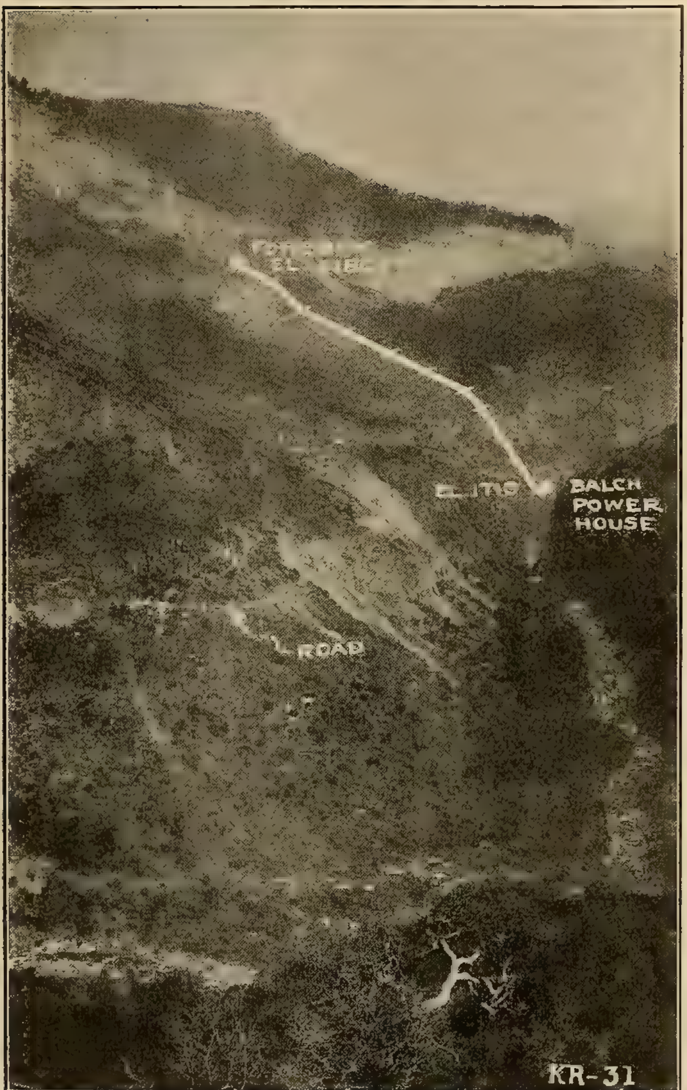
The present development is to provide for only one unit. Others are to be added as load conditions warrant. The initial dam is to be located at Williams Crossing and will be a concrete gravity structure having a free over-fall. The height from base to crest will be 65 ft. and the length at the crest 190 ft. It will form a 200-acre ft. surge pond and serve primarily only as a diversion dam. This will make available for power purposes the stream flow of the North Fork of the Kings River. As other units are necessitated, it is planned to absorb this initial structure in a larger dam to be constructed upon the same site. This larger unit is planned to be either a rock-fill or a multiple-arch dam 175 ft. high with a crest 800 ft. long. The site is ideal for the purpose, and is of such nature that the ultimate spillway may be located at the north end of the dam and the spill water carried down over the brow of the hill. The elevation of the crest of the diversion dam will be 4,065 ft., which will provide an initial effective head of 2,280 ft. and static head of 2,355 ft. The ultimate structure will raise the elevation of the spillway to 4,180 ft., increase the heads to 2,312 ft. and 2,470 ft., respectively, and create a 5,000-acre-ft. surge basin.

Major available storage sites further up in the mountains provide the possibility of future storage developments to the extent of 230,500 acre-ft. Lake Wishon at an elevation of 6,550 ft. can impound 128,000 acre-ft., while Lake Helms at an elevation of 8,170 ft. may be brought to a capacity of 102,500 acre-ft. Three intermediate power houses are projected to make use of this additional head some time in the future.

The tunnel from Williams Crossing to the Balch plant site will be about 19,500 ft. in length and 12 x 12 ft. in cross-section. This dimension will care for the ultimate development of this plant and will carry 720 sec.-ft. A slope of 3.3 ft. per 1,000 ft. of length has been selected as adequate. The approximate elevation of the tunnel intake is to be 4,030 ft. This will provide sufficient head at this point to overcome intake losses. Two adits will be driven 8,420 ft. apart at convenient places to provide a total of six working faces. No lining is expected to be necessary as the material through which the tunnel is to be bored is apparently solid granite.

A penstock of about 4,700 ft. slope length will be required to connect the tunnel exit at El. 3,966 ft.

with the nozzles at El. 1,710. These figures make apparent the steepness of the penstock. The upper 3,500 ft. of the penstock will be a single pipe while the lower 1,200 ft. will be split into two pipes on account of the pressures encountered. Penstock diameters will vary from 58 in. at the upper end to 26 in. at the lower. The thickness will vary from 3/8 in. to 1 1/2 in. Where the thickness is 3/4 in. or



View of the King's River Canyon (North Fork) shows schematically the location of Balch power house.

less riveted pipe will be used while lap-welded pipe will be used for the heavier sections. The weight of one penstock complete will total 1,664 tons of steel.

Balch power house itself will be built on the unit plan. The first unit will be sufficient to accommodate one 28,250-kw. generating unit, with provisions to facilitate the addition of the later units without interfering with the operation of the original equipment. The planned ultimate capacity of the plant is six units of the above size. Double-overhung, single-jet impulse wheels will drive the generators. Power will be generated at 11,000 volts and stepped up for transmission at 110,000 volts over a 39-mile line which will tie in with the existing San Joaquin system at Sanger substation, 12 miles east of Fresno.

Topographical conditions are such at the powerhouse site that it was necessary to place the plant on the opposite side of the river from the penstocks. There is no place large enough to accommodate the plant immediately at the foot of the penstock while across the river there is ample room. However, this introduced several peculiar features. The penstocks will be carried across the bed of the stream in heavy reinforced-concrete anchorages. Having the penstocks enter the plant from the river side means that the tail race will have to be constructed to care for the water without any back-washing effect and at the same time without undue erosion on the hillside back of the plant.

All materials will have to be hauled from the railhead at Piedra over country and private roads a distance of about 30 miles to the plant site and 40 miles to the dam site.

Twenty Years Ago

April, 1905

An Excellent Transmission Record

In its three years of operation the Northern California Power Company has suffered service interruptions aggregating two hours and fifty-four minues, not one second of which occurred at the power house. These interruptions were due to an eagle and a goose short-circuiting the line and to a flood in the Sacramento River which washed out a pole supporting the transmission span across the river.

Secretary Herbert Fleishhacker of the Truckee River General Electric Company announced that that firm will install a 1,500-kw. generating station on the Truckee River for the purpose of furnishing power on a ten-year contract basis to the mines of the Comstock Pumping Association.

The Benjamin Electric Manufacturing Company, of Chicago and New York, after making a thorough investigation of the remarkable development in the Pacific Coast field, has added San Francisco to its list of district offices with F. H. Ross in charge of headquarters in the Crossley Building.

The Abner Doble Company of San Francisco is building three 7,500 hp. wheels for the Electra plant of the Standard Electric Company. Two of the units will be connected to a 4,000-kw. generator forming a double unit for utilizing water from two separate sources under different heads. Either wheel is capable of driving the generator at full load. Two 800-hp. wheels have just been completed for the Santa Ana No. 2 plant of the Edison Electric Company of Los Angeles. Two 75-hp. exciter wheels have been built for the Pikes Peak Hydroelectric Company of Colorado to operate under a head of 2,100 ft., the highest in the United States.

A Central Station Load-Building Appliance Campaign

By A. Strauch
Electrical Heating Engineer, San Francisco

CERTAIN predetermined policies in merchandising appliances caused the two electric service companies described in this article to adopt an unique method of selling electric ranges, water heaters and other heavy domestic appliances. A capable sales force was organized; it worked in cooperation with contractors and retailers and at the same time produced remarkable results. In one year approximately 3,000 electric ranges were sold, and the total load added to the lines as a result of continuous sales effort has amounted to nearly 100,000 kw. The methods followed are outlined in this article.

THIS sales campaign is one which for some three or more years has been a consistent load-builder for two of the major power companies of California, both operating in part in the same territory. The same general plan is followed by both companies although there is no collusion in the execution of the sales effort nor has there been in the formation of the details of the plan. Local conditions have shown both companies that the best results can be obtained by following the general details as outlined in this article. The first step in connection with the decision to merchandise was to decide upon the extent to which it was considered desirable to enter the field of retailing. The next step was the determination of the devices to be sold, and the last major consideration was the organization of the sales force.

In general, local conditions seemed to warrant only a limited participation in the merchandising field. It was considered that on account of the fact that the dealers and contractor-dealers were doing a very fair job at selling small appliances—those commonly known as lamp-socket devices—and due to the desire to strengthen relations between the company and the retail trade, the attention of the central station should be directed only to the heavier devices such as electric ranges, water heaters and air heaters (of one kilowatt capacity or greater). Some few auxiliary devices, necessary to the proper operation of an electric appliance, were also included in the list of merchandise offered for sale. These devices were such as hot water tanks, household boilers, necessary for the operation of a water heater (and the insulating cover for same); limiting valves for reducing the amount of water to be kept up to temperature, and thermostats. Heavy-duty kitchen equipment was also listed, but it was generally preferred to have these sales go through dealers or those who made a specialty of this class of equipment. Information was supplied gladly to all inquirers, and the prospect was generally put in touch with the dealer. This method of procedure was followed on account of the usual need for special wiring on all such installations and also on account of the desire for better relations with the dealer or contractor.

The equipment listed for sale included that of the standard manufacturers, and, in general, only those devices were listed that had been proved to be satisfactory, either in general use before the start of the sales effort or by actual test by the central station. From time to time new devices were accorded the listing privilege but only after satisfactory evidence that the device would give a good service record. In some instances manufacturers endeavored to take special steps to have their equipment listed, but the policy in this regard remained unchanged, and if any device showed service defects of sufficient proportion or frequency that device was withdrawn from listing. This stand was taken from no arbitrary viewpoint but was purely for the purpose of giving to consumers the most satisfactory equipment from a service standpoint.

Organization of Sales Force

The sales force was organized along divisional lines. The head office formulated policies, determined lines to be handled and supervised the hiring of salesmen, but in the final analysis the division manager was looked to for results and was held accountable for the successful operation of the plan. This was an advantageous arrangement, as it placed responsibility for territorial conditions within the territory itself and had the further advantage of increasing the local division interest. It also permitted of closer contact between the consumer and the company official staff due to the fact that the division manager was advised of every transaction and, generally, of all prospects. This form of organization also proved of value in developing load other than that on which the prospect was originally solicited, and it has happened often that a prospect for a range only has been developed into a purchaser of equipment for an all-electric home; or has changed from a fuel pumping system to an electric; or has increased the use of electrical equipment in his home or business.

Salesmen secured prospects from many sources. Building reports, house-to-house calls, counter sig-

natures, reports from friends, subdivision operators, contractors, architects and almost countless other avenues were opened up for the securing of names of people who either were interested immediately or whose interest could be developed. Various forms of follow-up were employed, dependent in some cases upon the distance from headquarters to the prospect's residence (many of the best prospects lived in the country, in some cases as much as forty or fifty miles from the division office), but in general the personal call was most productive of results. In very few instances were sales made on the first call; occasionally the sale was not made for a year. However, it has been found that a persistent follow-up of those people who had the necessary money to pay for the equipment has produced gratifying results. In order to make easier the purchase of the equipment the companies instituted term-sales policies, these terms varying somewhat in detail for the different companies but in general allowing the buyer to take a year, or longer, to complete his contract, with an initial payment of twenty per cent or greater. No interest was charged on deferred payments, and the charge for the additional wiring required for equipment operation could be included in the term price.

Price Concession

On account of the fact that dealers generally had not produced in some years a notable volume of electric range and water-heater business, and because of the pioneering feature of this particular effort, it was decided to sell this equipment at special prices somewhat below manufacturers' list. Provision was made, however, so that a dealer could handle a sale and still make a profit. In brief the selling policy is as follows: The central station buys ranges, for example, in carload lots and warehouses them at division points, delivery to consumer or dealer being from the nearest point. To consumers the price quoted was net but to dealers the price was f.o.b. shipping point. To establish the selling price the companies adopted a differential above cost that allowed the dealer a profit of twenty per cent on the selling price of the equipment. To care for the special wiring generally required—unfortunately the majority of houses are wired for lights only, and often not adequately wired even for that purpose—the central stations arrived at the average cost of installing a range over their entire systems. This cost was then added to the selling price of the range, and the consumer was quoted accordingly, being told at the same time that he could buy the range not installed at a price lower by just the installation charge and then have the installation done privately. In only a small percentage of cases was this done, as consumers recognized that the central stations were dealing fairly and were not making a profit on the installation. In many cases, in fact, the installation actually cost more than the flat charge made for that purpose. In such cases the excess was absorbed by the central station. In no case did the power company do the installation wiring, this always being let out to contractors or contractor-dealers on competitive bid. In those cases where a prospect originated with a dealer no competitve bid was sought; if the dealer wanted to take over the sale and handle it to completion he was at liberty to do so, the central station selling him the range at cost.

Dealer Cooperation

All sales of listed equipment were made to dealers at the company's cost and no equipment was sold, either to consumer or dealer, that was not listed. The price on time sales was about 11 per cent higher than that for cash, but a purchaser was allowed to complete payment any time within the contract period and to deduct 10 per cent from the upaid balance at time of settlement. A high percentage of sales has been made on a time basis. An increasing number of sales is being made through dealers who have awakened to the sales possibilities of this equipment and to the fact that such sales lead to others. Dealers, however, frequently advance the argument that the 20 per cent margin is not sufficient, but they generally recognize the fact that they cannot afford to stand the high sales cost that attends the handling of this type of equipment. The situation seems to be fairly satisfactory, and it commonly is felt that as soon as expedient the central station will retire from the merchandising field and leave to the dealer a clear path for continuing this effort. Past history perhaps is not a sufficient precedent for judgment, but it records clearly that dealers have not developed the electric-range and water-heater field. For that reason alone central stations have felt justification for at least laying the foundation for the continuation of this work. Pioneering of appliances is a logical function of the central station and until the range is accepted by the public the power company must bear the burden.

In addition to the foregoing, displays were made at the state and county fairs in the shape of model kitchens, and demonstrations of electric cooking were held in women's clubs and other places about the systems. All of this attracted considerable attention and assisted materially in creating interest and securing prospects.

Results of Campaign

The campaign above outlined in its execution has been very successful. Sales of ranges in one year have amounted to more than three thousand, and these sales have brought the sale of about one-half as many water heaters. In addition to these items, there have been added thousands of electric air heaters of one kilowatt or greater capacity, and this sales effort has brought about the electrification of many homes. The territory served by these companies is thickly dotted with all-electric homes, and the additional load on the lines due to this campaign amounts to more than 100,000 kw. All of this load has been taken at an attractive rate and under load conditions that are very favorable. The campaign has shown, above all else, the value of continued and persistent sales effort as opposed to spasmodic, intensive drives. Also it has proved of value in the matter of public relations, for the salesmen have been able to establish close contact with the consumers and have very frequently been able to iron out difficulties and to strengthen good will.

What Classes of Consumers Are Good Range Prospects?

A DEFINITE basis for determining who shall be considered a good prospect for the purchase of an electric range has been worked out by the California Oregon Power Company. The method, which is based on the assumption that any consumer using over $2 worth of electricity per month for lighting and small appliances is a prospect, has worked out to the satisfaction of the company. The prospects secured in this way have been turned over to local contractor-dealers, who with the assistance of a letter campaign by the power company complete the selling work.

THE question as to who shall be considered as a good prospect for an electric range has been worked out by the commercial department of the California Oregon Power Company on a basis which has obtained satisfactory results.

The plan as worked out by the company calls for the grouping of residential consumers according to their average consumption of electric energy for lighting and small appliances. After this grouping has been made, the class using over a predetermined number of kilowatt hours during the six-months period from which the average is taken, is considered to include only those who are potential electric-range prospects.

In preparing a base for its grouping plan, the California Oregon Power Company decided that any residential consumer having an average monthly bill of $2 or over could be considered as a person to whom an electric range might be sold. Having once determined that a customer who paid an average monthly bill of $2 or more for lights and small appliances was a prospect, the company set about the acquiring of data on the average consumption of an electric range. An analysis of the consumption of 500 electric range customers, taken at random, shows an average monthly use of 161 kw-hr. for cooking, lighting and small appliances. Assuming that the average consumption of the lights and small current-consuming devices was 20 kw-hr. per month, the balance or 141 kw-hr. could be charged against the electric range. Carrying the analysis of the electric-range consumption farther, the company found that The Society for Electrical Development estimated the average monthly consumption of an electric range being used for a family of 4.2 persons was 125 kw-hr. To be on the safe side of the question the commercial department of the company determined to estimate the monthly consumption at 150 kw-hr.

Having made the decision as to what should be considered as the class of customers who might be interested in the purchase of an electric range, the company next set about preparing a merchandising plan to reach this class. The lighting, cooking and heating schedule of the utility was taken into consideration, and from this typical monthly bills were prepared. Taking the average consumption of 161 kw-hr. where an electric range was used in the home, the monthly bill was found to be $5.62 in the Oregon territory. After deducting the average of 20 kw-hr. per month that was considered to be for lighting, the charge for cooking was $3.42. The rates in the California territory served by the company are slightly different and will not be considered here.

A study was then made of all lighting consumers' accounts, using the consumers' ledger and, using the average kilowatt-hour consumption from Jan. 1 to June 30, those customers whose bills amounted to $2 or over were noted. The average consumption of each of these customers was determined, and an individual study was made of each case. Then a letter was written to each of these customers stating that the average consumption was a certain number of kilowatt-hours, for which the charge at the lighting rate was a definite amount and that for a small additional amount the customer could have the benefit of electric cooking in his home. Typical average monthly bills of twenty consumers and the additional cost for 150 kw-hr. for cooking purposes are shown in Table I.

Table I. Showing average kilowatt-hour consumption for lighting and small appliances; average bill for same; and additional cost for 150 kw-hr. for cooking.

	Average kw-hr. consumption	Average 6-mo. bill per schedule O	Additional for 150 kw-hr. per schedule R
Customer No. 1	26	$2.80	$3.12
Customer No. 2	39	4.10	2.08
Customer No. 3	29	3.10	2.88
Customer No. 4	36	3.80	2.32
Customer No. 5	32	3.40	2.64
Customer No. 6	20	2.20	3.60
Customer No. 7	27	2.90	3.04
Customer No. 8	26	2.80	3.12
Customer No. 9	25	2.70	3.20
Customer No. 10	25	2.70	3.20
Customer No. 11	47	4.90	1.44
Customer No. 12	19	2.10	3.68
Customer No. 13	19	2.10	3.68
Customer No. 14	26	2.80	3.12
Customer No. 15	28	3.00	2.96
Customer No. 16	26	2.80	3.12
Customer No. 17	23	2.50	3.36
Customer No. 18	23	2.50	3.36
Customer No. 19	21	2.30	3.52
Customer No. 20	39	4.10	2.08

The letters were sent out by the district managers of the company and showed a personal interest

in the welfare of the consumers in each manager's territory. The letters were of course subject to change to meet individual conditions. A sample letter used by the company reads as follows:

Mrs. John Smith,
Medford, Ore.,
Dear Mrs. Smith:

Many of our lighting customers have been interested in knowing that for a comparatively small extra cost monthly, a wonderful saving in the kitchen work and cooking results can be made. We have taken the time to look up your personal account and find that you have been paying us under Schedule O (Residence lighting schedule) an average of $2.10 per month for this service. An analysis of our combination lighting, heating and cooking rate (Schedule R) shows that for the additional sum of $3.68 per month you can have the same service for lighting and sundry small appliances also 150 kilowatt hours of current for cooking each month. This amount of current is a trifle more than the average which is being used for cooking each month by the families who have this service in our territory.

Can you buy the fuel you are now using and take care of the ashes, build the fires and do many other things that are necessary with the use of coal or wood for $3.68 per month? We will be glad to talk this over with you at your convenience. We feel sure that we can prove to you conclusively the saving we can make for you.

With kindest regards, I remain
Yours very truly,

____
Division Manager

At the time that the letters were sent to the consumers, copies were mailed to the contractor-dealers in the city in which the prospect lived. As the company does not merchandise electrical equipment of any kind the follow-up on this direct-by-mail campaign was left to the contractor-dealers.

Personal Solicitation Employed

The information regarding the additional advantages that were awaiting the housewife who would install an electric range was well accepted by the people reached by the letters. Personal solicitation by the contractor-dealers in the territory was used to interest the prospects still further and demonstrations of the efficiency, cleanliness and ease of operation of the electric range were given to increase sales. The combination lighting, cooking and heating rate undoubtedly had a considerable bearing upon the success of the campaign to increase the use of electric ranges.

In addition to giving the contractor-dealers the names of the prospects that it had secured, the central station prepared an electric-range manual designed to present to the range salesman the correct method of approaching the prospective customer. This book outlined the best talking points of the electric range and stressed the point of selling the "idea" rather than the range as so much metal. Better cooking, easier cooking, and cleaner cooking were suggested as the high spots in the salesman's talk.

The operating costs of the electric range were presented in a series of tables giving the actual costs of preparing a series of meals using the oven to cook the food. One of the tables is as follows:

Actual time current is used to cook an oven dinner consisting of a 6-lb. roast of beef with two vegetables. Preheat oven for 15 min., as shown below:

Upper element on high for 15 min., 15/60 of 1,500 watts=	375 watt-hours
Lower element on high for 15 min., 15/60 of 1,500 watts=	375 watt-hours
Lower element on high for 10 min., 10/60 of 1,500 watts=	250 watt-hours
Lower element on medium for 1½ hr., 1½ x 375 watts=	1,125 watt-hours
Upper element on low for 1½ hr., 1½ x 375 watts=	562 watt-hours
Total current used	2,687 watt-hours or 2.687 kw-hr.

The cost to the average consumer in Oregon for 2.687 kw-hr. at 2c. per kw-hr. is 5.37c. Thus, the cost of cooking the dinner in the oven would be but 5.37c.

The data for the series of tables were prepared by one of the domestic-science experts demonstrating electric ranges in connection with electric-range cooking schools. The time tables were strictly followed by the instructor in preparing meals before the public.

Selling Water Heating

This range-sales manual also contained a section devoted to the selling of water-heating equipment. Every housewife that was considered a prospect for an electric range was also a potential purchaser of an electric water heater. To stimulate this use of electricity the company provides a flat rate for water-heater service where the water-heater and the range are connected with a double-throw switch, permitting only one to be on the line at one time. For this service in Oregon the flat monthly charge is 0.0035 per watt of connected load. Where the water heater is connected on a separate circuit there is a choice between a metered rate and a combination service and connected load charge.

Although The California Oregon Power Company does no merchandising it is deeply interested in the sale of all current-consuming devices. In addition to preparing the list of prospects for the local contractor-dealers, it buys electric ranges in carload lots and sells them to the dealers at cost. In this way the interest in the dealers in the sales of electric ranges is stimulated by the greater profit accruing to them through the lower cost per range. Central-station company salesmen assist dealers in making the sale of the ranges but do not definitely accept orders for any merchandise.

Results of Sales Effort

The method pursued in developing electric range and water-heater load has brought about a very considerable saturation. As of Dec. 31, 1924 the company had on its lines 1,676 domestic electric ranges and 293 commercial electric cooking and heating installations. The saturation for the entire system was something over 15 per cent of the domestic consumers; that is to say, something over 15 per cent of all domestic consumers served by the company cook with electricity. The degree of saturation varied considerably in the different towns, the lowest being something over 11 per cent and the highest nearly 28 per cent. During the year 1923, 250 electric ranges were added to the lines of the power company and during the year 1924, 373 ranges were added. The quota for the year 1925 calls for 560 new range customers.

Comparative Costs of Operating a Gas and an Electric Apartment

COST of operation is the specter which stands in the way of complete electrification of many homes. Despite the advertising dollars of the industry that have been spent to tell the public that electricity for cooking, for heating and for water-heating is more convenient, more satisfactory and no more expensive than other types of fuels, the idea remains that an electric home is an expensive luxury. Fully half a million people have visited the electric homes which have been displayed in the Western states, yet this idea persists. They are sold thorougly on the various small appliances—the iron, vacuum cleaner, washing machine, percolator, toaster, waffle iron and other devices, and they are ready to believe that electricity is more desirable for the major household uses than other types of fuel on account of its dependability, cleanliness, efficiency, and ease of control, but they hesitate at complete electrification on account of the fear of high bills.

A comparison of the cost of fuel in the completely electrified apartment of George C. Tenney, managing editor, Journal of Electricity, and a similar sized apartment in which gas was used for cooking, water-heating and house-heating for the same number in the family shows such is not the case. In fact, the figures over the same period of time show a relatively small difference when the arguments in favor of electricity are considered.

TABLE NO. 1—Cost of Operation of Electric Apartment.

Meter Reading Date	Kw.-hr.	Amount
1923.		
April 3	614	$ 16.24
May 2	628	16.31
June 2	479	13.33
July 2	391	11.57
Aug. 1	253	8.81
Sept. 1	195	7.65
Oct. 2	246	8.67
Nov. 1	273	9.21
Dec. 3	434	12.43
1924.		
Jan. 3	562	$ 14.99
Feb. 1	584	15.43
March 3	450	12.75
April 2	269	9.13
May 2	401	11.77
June 3	84	3.99
July 2	174	7.14
Aug. 2	374	11.23
Sept. 2	420	12.15
Oct. 2	278	9.31
Totals	7,109	$212.11

Average monthly consumption .....374 kw-hr.
Average monthly bill $11.15
Average monthly bill, July 1, 1923, to Aug. 1, 1924 (period similar to gas apartment) $10.07

The electric apartment consisted of four rooms. There were installed a 6-kw. range,7 kw. in air heaters, a 5-kw, water heater and 6 kw. in lights and miscellaneous appliances, including a vacuum cleaner, two percolators, a waffle iron, a grill, a toaster, two irons, a radiant heater and other small appliances. There were three persons in the family. The rate applicable was the C-1 B-1 schedule of the Pacific Gas and Electric Company.

The gas apartment was chosen at random from the accounts of the Pacific Gas and Electric Company, the only conditions being that there should be the same number of rooms, the locality in San Francisco should be approximately the same and there should be the same number of persons in the family. The gas equipment consisted of a four-burner cabinet range, a gas water heater and a gas-fired furnace with four radiators. Electricity was used for lighting and for the operation of a few small appliances.

The monthly bills for the electrified apartment for the period March 1, 1923, to Oct. 1, 1924, are shown in Table I. The bills for the gas apartment for the period from July 28, 1923, to July 21, 1924, are shown in Table II. The entire fuel bill in the electrified apartment over a period of nineteen months was $212.11 or an average of $11.15 for 374 kw.-hr. of energy per month. The average bill over the same period as accounts are available for the gas apartment was $10.07. The difference is explained in the fact that the high bills of the first three months when experience was being gained in the regulation of the electric heaters are not included in the later period.

Table No. 2—Cost of Operation of Gas Apartment.

Meter Reading Date	Gas Bill	Electric Bill	Total
Aug. 24, 1923	$ 4.56	$ 1.27	$ 5.83
Sept. 22	5.06	1.78	6.84
Oct. 23	5.52	2.71	8.23
Nov. 22	7.64	2.54	10.18
Dec. 22	10.33	2.80	13.13
Jan. 23, 1924	16.17	3.31	19.48
Feb. 19	13.98	2.71	16.69
March 20	5.80	2.04	7.84
April 20	5.34	2.04	7.38
May 19	3.96	1.26	5.22
June 20	3.68	1.32	5.00
July 21	3.31	1.20	4.51
Totals	$85.35	$24.98	$110.33

Average monthly gas bill $7.11
Average monthly electric bill 2.08
Average monthly total bill 9.19

For the gas apartment the average gas bill was $7.11 and the light bill $2.08 or a total of $9.19. The actual money difference in favor of the gas-equipped apartment is 88 cents. However, there are certain incidental charges that do not appear in the fuel bills. The added convenience of the electricity can not be measured in dollars and cents. Cleanliness can. At the end of nineteen months the walls of the electric apartment were as bright and clean as at the time the apartment was first occupied. At the end of twelve months in the gas-equipped apartment the kitchen was repainted and the walls of one room retinted. This is only one of the many intangible arguments which might be cited in favor of electricity.

CENTRAL STATION CONSTRUCTION OPERATION AND MAINTENANCE

Baker River Pressure Tunnel Nears Completion

Pilot-Tunnel Method and Hand Mucking Used to Advantage in Driving 1,400-ft. Bore Through Limestone.

By W. D. SHANNON, Division of Construction and Engineering, Stone & Webster, Inc., Seattle.

The sketch map accompanying this article gives a general idea of the development which is being made on the Baker River in Skagit County, Wash., for the Puget Sound Power & Light Company. The work is being done under the direction of the Division of Engineering of Stone & Webster, Inc.

The first piece of heavy construction work was the driving of a diversion tunnel to take care of the waters of the Baker River during the construction of the main dam. A considerable portion of this diversion tunnel is later to be used for the main pressure tunnel, which will supply the turbines.

In order to speed up the driving of this tunnel, which is approximately 1,000 ft. in length, two adits were driven, known as adits A and B, respectively, the tunnel then being driven both ways from the points of intersection. A face was also given by the driving of the lower end of the diversion tunnel, so that altogether five faces were used during the driving.

The portion of the tunnel from the intake shown in the drawing to station 1+12.35 was driven 24 ft. in diameter, this being the diameter decided upon for the main pressure tunnel. The balance of the tunnel was driven with smaller cross-section, being 17 ft. high and 24 ft. wide, with a slightly arched roof.

The actual driving of adits and tunnel was begun the first week in May, 1924, and the diversion tunnel was completed Aug. 20, 1924. The tunnel was driven at just as low a point as possible so that the intake would divert all the water of the Baker River during periods of low flow with a very small cofferdam. The lower end of the diversion tunnel was therefore nearly at the bed of the river so that the water gradient of the tunnel was practically that of the river.

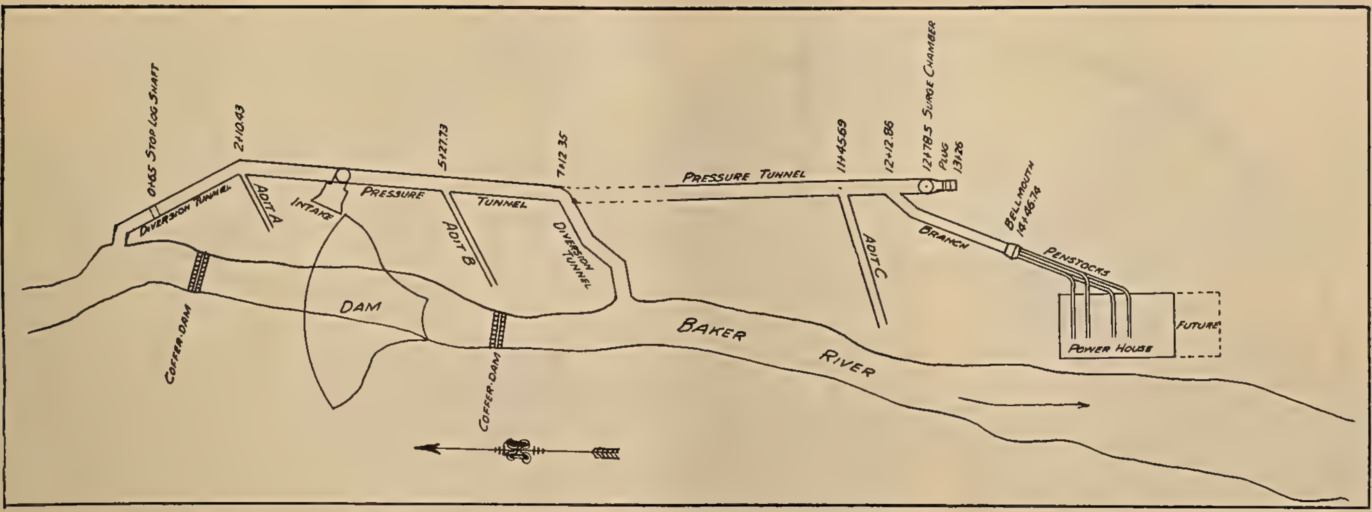
In order to make certain that the driving would be a continuous one, adits A and B had their portals some 30 ft. above the river bed. This made them slope adits and served to keep the water out of the tunnel when the river was high.

Immediately after the diversion tunnel was put into service, the driving of the balance of the main pressure tunnel between the diversion tunnel and the surge chamber and the power house was begun. On Feb. 5 there remained only 80 ft. of the main tunnel to drive and 100 ft. of the penstock tunnel to complete.

The surge chamber is located as close to the power house as possible, is 250 ft. deep and 22 ft. in diameter.

The main pressure tunnel, when completed, will be lined with a 12-in. ring of concrete, making a 22-ft. finished diameter, while the surge cham-

South heading from adit "C," pressure tunnel of Baker River Development of Puget Sound Power & Light Company. This photograph was taken Nov. 2, 1924, and shows the adit-entrance at the right, the hand-operated mucking equipment and the drilling apparatus set up in the 10-ft. pilot tunnel.



Sketch map showing scheme of physical layout of the Baker River Development.

ber will be lined with a similar ring, making it a 20-ft. finished diameter.

In driving the pressure tunnel it was found that costs could be kept at a minimum by drilling on one heading while mucking was being carried on at the other. Sketches given herewith show the drilling which was done on the large heading. It will be noted that a small pilot tunnel 10 ft. in diameter was driven in advance of the main tunnel, with the drill holes located as shown in the sketch.

The order of firing holes is indicated by the numbers opposite them, which are also the numbers by which the delay caps are designated; that is, No. 1 delay explodes first, No. 2, second, and so on. There are also four so-called "bulldog" holes shown converging near the center of the pilot tunnel. To these holes no numbers have been assigned. These four holes are fired instantaneously. Next come the No. 1, or cut holes. Then the No. 2, or relievers, followed by Nos. 3 and 4, the side or back holes, and last Nos. 5 and 6, or lifters. At the same time that the pilot-heading charges are being fired as above outlined the rings are also being fired. The upper half of the first ring is fired with No. 3 and the upper half of the second ring is fired with No. 4. The lower half of the first ring is fired with No. 1 and the lower half of the second ring is fired with No. 6. The third ring is left for the next round.

Two bars are used in each heading with two drills mounted on each, each machine being manned by a driller and chuck tender.

With this method of firing, the muck is thrown well back from the heading onto steel plates laid on top of the rails of the track, leaving the heading itself nearly clear and making it possible to resume work in the heading just as soon as the gas has cleared. On account of the short length of the tunnel, it was decided to do all mucking by hand and the results have been very gratifying.

There are three narrow gage tracks laid down in the main tunnel so that three gangs of muckers can work at one time.

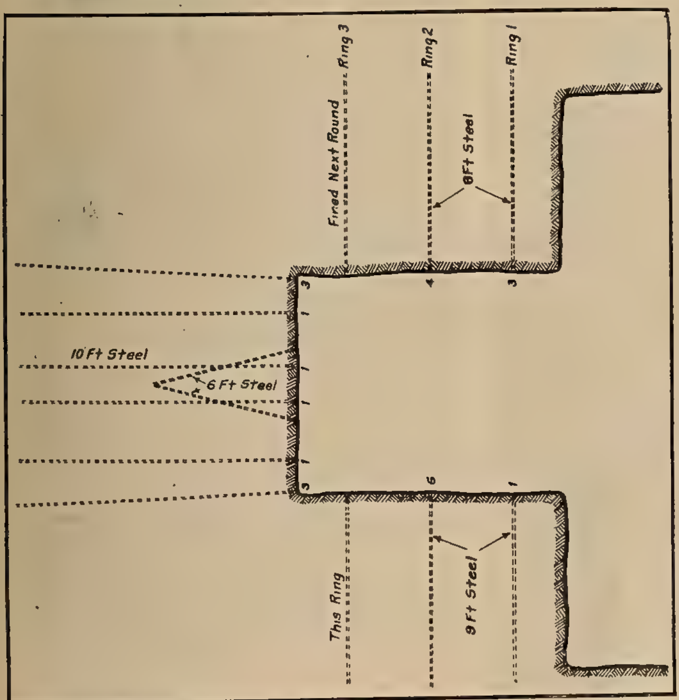
With this method of operation, an average of 7 ft. of completed tunnel has been driven each day. The rock is hard limestone with practically no seams in the entire length of the main tunnel, and breaks in one-man sizes and smaller, so as to be easily handled.

Hollow round steel 1¼-in. in diameter was used in lengths from 2 to 12 ft. and approximately 650 lb. of 40 per cent powder were used per round.

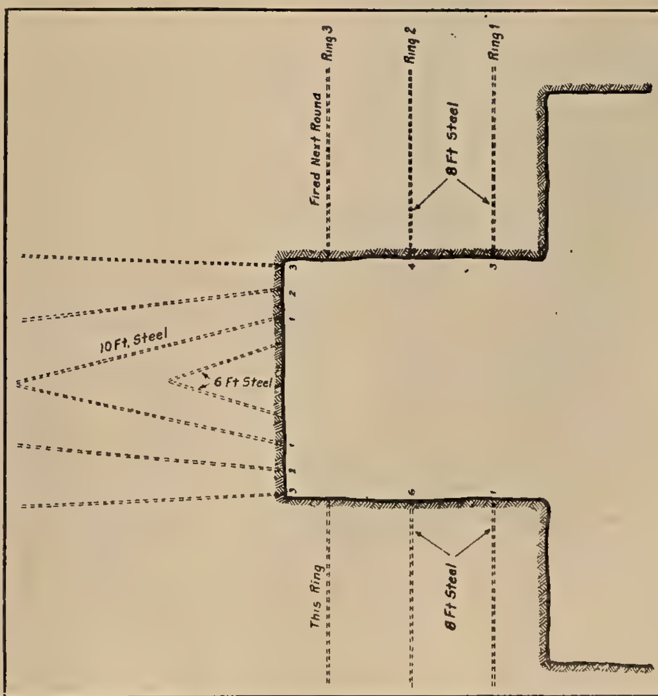
Loose Rotor Bars Well Repaired With Silver Solder

Severe starting conditions caused the loosening of the rotor bars of an induction motor in a certain industrial plant. While this particular item had caused no operating trouble, it was discovered when the machine was down for an overhauling. In correcting this condition silver solder was used to secure the bars in place.

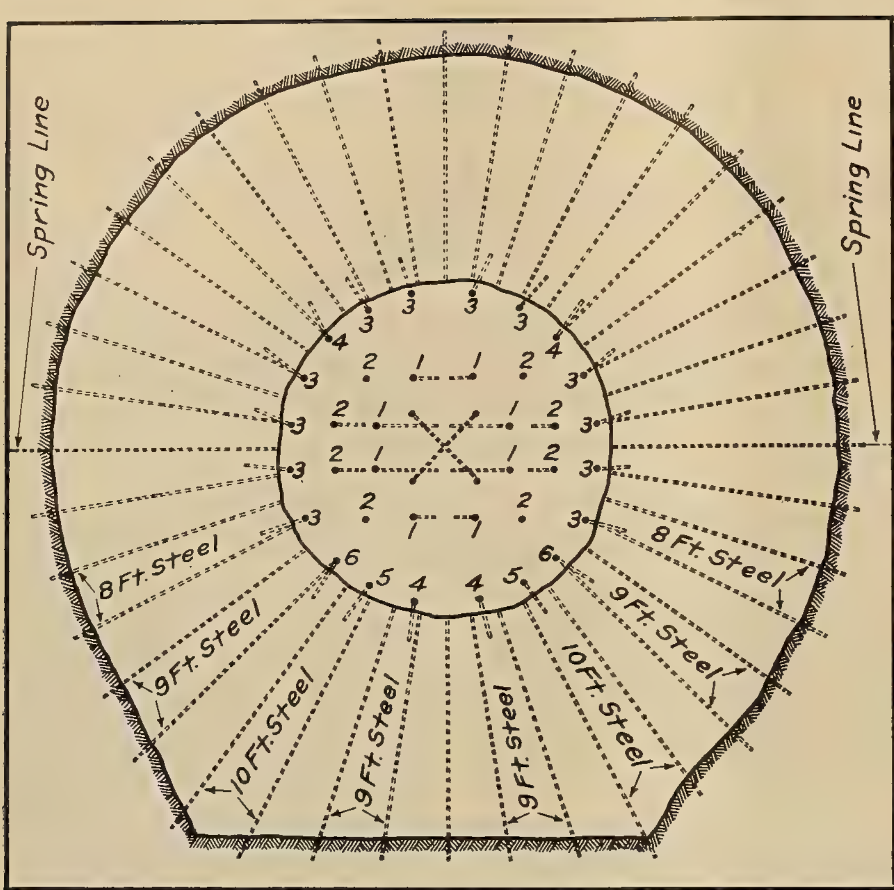
It is practically useless to use ordinary solder on rotors, as any severe



Longitudinal section adjacent to tunnel heading showing arrangement of drill holes in the face. Numbers indicate firing order.



Horizontal section adjacent to tunnel heading showing arrangement of drill holes in the face. Numbers indicate firing order.



Cross-section of tunnel at pilot tunnel showing arrangement of drill holes in the face. The holes are fired in order according to the number which they bear, with the exception of the four "bull-dog" holes at the center of the heading. These are fired together as a leading charge. Above the spring line, the first ring is fired with No. 3 and the second ring is fired with No. 4. Below the spring line, the first ring is fired with No. 1 and the second ring is fired with No. 6 (See page 249).

overload will cause the bars to heat and throw out the ordinary solder. It is comparatively easy to silver-solder rotor bars if the copper section is large enough to prevent melting the copper under the oxyacetylene flame. There is, however, one point to observe particularly. The copper must be absolutely clean before attempting to solder. In the case under discussion the cleaning was accomplished by suspending the rotor by means of a crane over a small tank of chemical cleaning compound which was kept boiling by means of a gas heater. The rotor was revolved in this cleaning solution, and all dirt, grease and foreign matter were removed quickly. After this careful cleaning process the silver solder was applied.

A New Use for Electricity.—A visitor in a San Joaquin Valley city recently reported having seen in the display window of a progressive appliance salesroom a sign worded as follows: "Don't kill off your wife—let electricity do it."

"Some of the things said over the wires," declared a telephone operator to a lineman making repairs, "are not fit for me to hear."

"Aw," declared the lineman, "you can't expect to work around electricity and not get shocked."—Flapper.

The reason some people do not recognize opportunity when they see it is because opportunity usually goes around looking like work.
— B. E. Electric Employees' Magazine.

Magnetic Separator Preserves Combustible Material

In actual operating practice the amount of combustible material in boiler plant refuse may range anywhere from a few per cent to as high as forty or fifty per cent. In Europe magnetic separators have been used with considerable success. As high as 87 per cent recovery has been reported for these machines.

The principle behind the apparatus is that when coal is subjected to heat, the ash-forming constitutents tend to fuse together into clinkers quite separate from the unburned coal and coke. These clinkers are slightly magnetic because they contain all of the iron present in the ash. By crushing the boiler refuse to such a size that the bond between clinker and combustible material is broken, and passing the whole over a magnetic field, the clinker is retained by the magnet while the combustible material passes on.

A Sectionalizing Switch is installed about every 20 miles throughout the 200-mile length of the 165,000-volt transmission line between the Caribou plant of the Great Western Power Company of California and San Francisco. The sole object of these hand-operated, air-break switches is to facilitate the sectionalization of the line for purposes of testing when serious trouble occurs. The accompanying illustration shows a tower in process of being fitted with these switches. To facilitate the safe and quick handling of the switches, a platform is built on the tower about 10 ft. below the switch.

Bank Rating Increased 50 Per Cent by Water Spray

Three 100-kw. transformers at a small hydro station are installed above the forebay to serve a local load. Their rating was increased to 450 kw. total during the summer by simply installing a spray to play water upon the self-cooling ribs along the sides of the units.

A 1-hp., 110-volt motor drives a small reciprocating pump which pulls water from the forebay and forces it into a ¾-in. pipe running from the pump along the side of the bank of transformers. This pipe is drilled at convenient intervals to form a spray onto each tank. Most of the water is conserved by draining it back to the forebay.

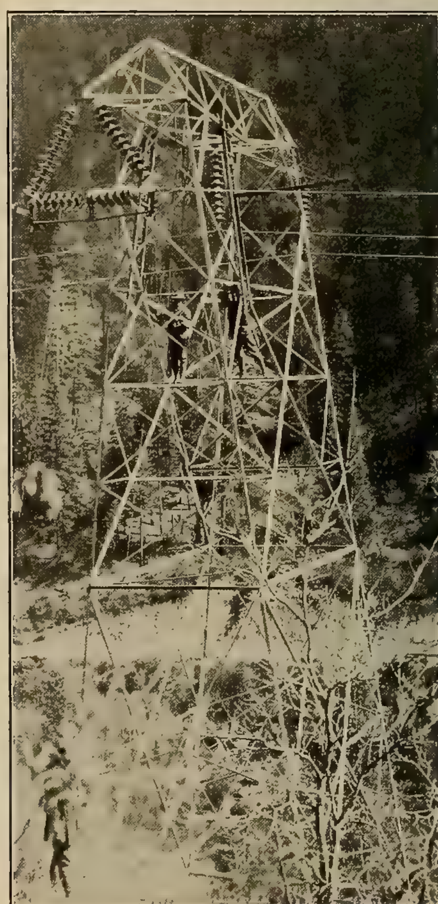
You have not wasted —

— the courtesy you have shown a customer.
— the time you spent in worship.
— the effort invested in training your talent.
— the strength spent in lifting another's burden.
— the praise given a faithful associate.

— Oklahoma City Times.

Student: "What is a consulting engineer?"

Professor: "A consulting engineer is a practicing engineer out of a job."
— Engineering News-Record.



A tower in the Feather River Canyon on the Caribou line of the Great Western Power Company of California showing line-sectionalizing switches being installed.

Interior view of Moccasin power house of the city of San Francisco. The picture was taken Nov. 30, 1924 at the time hydraulic and generating units were being installed.

Insulator Tests Now in Progress at Oregon College

In cooperation with the overhead systems committee of the Northwest Electric Light and Power Association, the electrical engineering department of the Oregon Agricultural College, Corvallis, has recently commenced the insulator tests mentioned in the Journal of Electricity, Oct. 15, 1924, p. 302. These tests, which are being carried on by advanced students in electrical engineering as extra work outside of their regular courses, under the direction of Prof. F. O. McMillan, will take over a month to complete. It is expected that the data will be available as part of the report of the Technical Section of the northwest association this year.

Members of the association have been invited to visit the laboratory of the Oregon Agricultural College while these tests are in progress. Many members of the Technical Section have availed themselves of this opportunity, as have a number of the representatives of the manufacturers that had furnished insulators for the test. On Feb. 21, 1925, about sixty members of the Portland A.I.E.E and Northwest Electric Light and Power Association made up a party and chartered a special train for a day's trip to Corvallis to view the tests and to see the Annual Educational Exposition of the Oregon Agricultural College, which opened that day.

Electric Air Heaters Supplement Defunct Steam Heat

Electric heaters have solved one problem for the American District Telegraph Company. The Brooklyn, N. Y., office and the Portland, Ore., office of this company are located in high-grade office buildings, in which the steam heating systems are not maintained through the night period.

It is essential that the men on duty in these offices during the night shall be wide awake and alert to handle without delay any signals which may come in over the fire alarm, burglar alarm, night watchman and sprinkler supervisory systems operated by the company. It is obviously important, therefore, that no heating apparatus be installed which would tend to devitalize the air. Steam heat is of course entirely satisfactory where and when obtainable. However, in the cases mentioned the company has found that electric air heaters assure the proper air conditions during the night.

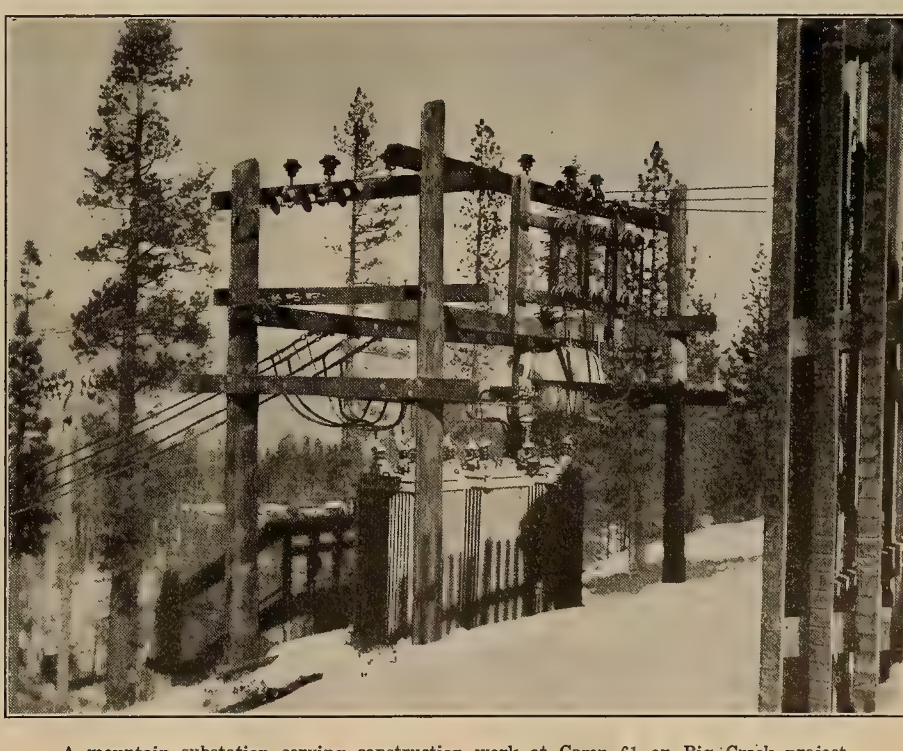
It is interesting to note the moderate heating capacity required. In the Brooklyn office a room 20x35x12 ft. is kept comfortable during the coldest night by the use of two 2,000-watt heaters. The Portland requirements are not so severe. These heaters have made possible the operation of the "graveyard" shift under conditions parallel to those under which the more fortunate employees work.

New Factory Is Being Built by Chicago Manufacturer

A new factory designed to facilitate the manufacture of potheads and boxes has been erected by the G.&W. Electric Specialty Company at 7780 Dante Avenue, Chicago. The new building contains approximately 30,000 sq. ft. of factory space and about 3,000 sq. ft. of office space. The new building is the first unit of the company's construction program, and on one side the wall is of temporary nature. The cost of the structure will be about $110,000.

The factory layout has been designed to speed up production by the elimination of unnecessary travel during the various processes. Portable assembly benches which are transported by means of elevating trucks, will be used in the factory. The company believes that by using the sectional assembly benches the actual handling of materials may be lessened considerably.

An Outdoor Distribution Substation located where it suffers all of the weather conditions imaginable is shown in the accompanying illustration. The capacity of the substation is 1,200 kw. at 15,000 volts on the high side and 440 volts on the low side. Its purpose is to supply the current necessary for light, heat and power at Camp 61 on the Florence Lake tunnel project of the Southern California Edison Company. The elevation is somewhere near 7,500 ft.



A mountain substation serving construction work at Camp 61 on Big Creek project.

IDEAS FOR THE CONTRACTOR

Standardized Panel Switchboard for Pumping Plants Urged

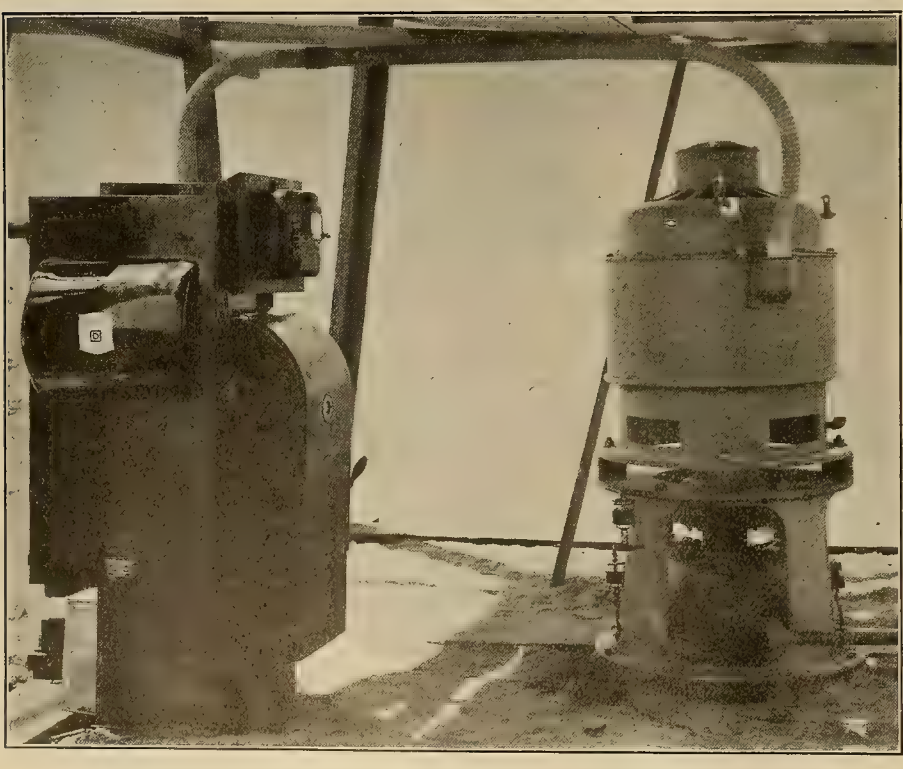
By E. S. CONRAD
Square D Company, San Francisco.

Electrical installations in districts that come under the active inspection and supervision of municipal or state authorities are generally comparatively safe and generally economical for the user. Beyond the bounds of these districts the electrical contractor's conscience is more or less his only guide or law.

The tremendous field, particularly in these Western states, for the use of electricity for the supply of water in the agricultural districts, requires the installation of hundreds of pumping plants, large and small, every year. Nearly all of these installations being in the districts not under the direct and active inspection of state or municipal inspectors, the general standard of electrical construction, unfortunately, has been in many cases relatively low. It will not be necessary for those electrical contractors or irrigating pump manufacturers or their engineers to concentrate seriously in order to visualize perhaps a great many irrigating pump electrical installations that are far below the standards of good work. Those who made these installations are not proud of them. The rough haphazard boards leaning, possibly in a faltering manner, against the wall of a frail pump house covered with a tangle of wires and open current-carrying parts is not a safe or economical installation for the man who paid out his good money for that job. It certainly is not a credit to the man who installed it.

In the outlying districts where so many of these pumps are installed each year the reputable contractor's responsibility increases more than elsewhere. Are the electrical men who are going to install these pumps this year going to assume that responsibility? Whether these installations become more safe and economical for the owner depends greatly upon the stand taken by the electrical contractor who does that work. If these improper installations are to stop, the electrical contractor must do his share towards bringing about that betterment. There may have been some justification for rough boards and tangled wire several years ago, but there is little justification and little excuse for that class of work today. A few of the reputable installers of this class of work have realized that this condition must change and have made an effort to standardize and build a pump panel of greater reliability and greater safety.

The manufacture of such board was carried out only in a very small way until about two years ago. At that time W. R. Mongerson of the Mongerson Electrical Machine Works at Bakersfield, Calif., saw the possibility of a high-grade standardized board which could be sold through the contractor. This company was equipped to manufacture these boards of the highest type construction. It turned out a few and placed them with various electrical contractors and was greatly encouraged by their enthusiastic reception and demand.



A modern installation by the Peerless Pump Company using a Mongerson panel board.

The average contractor-dealer is in the wiring business and is not ordinarily equipped to build a high-grade pump panel at a reasonable price. That is a specialty and a function for the manufacturer. As the demand increased for these better type of pump panels, it became known more widely that a board of this type that would compete with the other type was available at a reasonable figure. The demand for this type of board increased tremendously. Special equipment was installed for the manufacture of these panels, and the plant capacity increased. The Mongerson company is now specializing on boards of this type, and the constantly increasing demand has made it possible to produce a really high-grade pump panel at a relatively low figure which will well compare with what it will cost the average electrical contractor to build a few boards a year in his own shop.

The Mongerson board is a self-contained panel entirely built up of the highest grade type safety switches and starting equipment. Boards to control 7½ hp. motors and under are equipped with low-voltage release and overload relay and starting equipment of the push button type. The larger sizes may be equipped at the plant with the compensator which is furnished by the contractor or shipped without the compensator which may be quickly installed on the job. The panels are completely wired ready to install and approved on the lines of any central station. The main switch is provided with meter test sockets so that the power company may make frequent load tests without interrupting the customer's service. The panels are of a heavy gage steel rigidly supported and electrically welded. They are well finished and present a pleasing appearance.

The distributing and marketing policy in connection with this product has been designed to protect the contractor-dealer. It is intended that this device be sold entirely through the channels of the contractor-dealer. The boards are not installed or sold direct by the manufacturer except where it is impossible to have them handled through the dealer, and then only at a price which leaves a possible margin of profit for a dealer.

As has been said, these boards are completely wired, and it is only necessary to connect the service wires to the entrance switch and run the leads from the starter to the motor. Quite often when the user decides that he wants a pump installed he wants it without un-

necessary delay. Immediate installation is a factor in favor of the contractor who is able to give immediate service.

These boards may be carried in stock and one or more on the show-room floor affords one of the most tangible and best selling arguments the contractor could use. It is possible to sell the job complete and be in a position to give the customer a connection without delay.

Battery Charging Outfit Installed by Los Angeles Store

The Broadway Department Store of Los Angeles, Calif., has built up a remarkable installation of small motor-generators for charging the batteries of their fleet of electric trucks operating throughout Los Angeles and Hollywood. The unusual feature of the installation is that, instead of having one large motor-generator for supplying the necessary current, the outfit consists of five 10-kw., 250-volt equipments, each capable of taking care of two trucks at a time. These equipments, which were built by the Westinghouse Electric & Manufacturing Company, have complete automatic features and do not require the supervision of an operator. Their great advantage, however, lies in the fact that the installation is flexible and can be increased as the number of trucks operated by the company is increased, thus distributing the first cost of the battery charging equipment over a long period of time. The Broadway store started their electric fleet two and a half years ago with two trucks and one motor-generator charging set. The fleet has since been increased to eight 1-ton and two 2-ton trucks and the charging equipment to five motor-generators. The 1-ton trucks have Edison 60-cell A-6 batteries, while the 2-ton trucks have Edison 60-cell A-8 batteries.

The five Westinghouse motor-generators are installed in a separate room in the garage and protected by fire doors from any dust and dirt from the main room of the garage. They are mounted on a raised concrete platform, about 3½ ft. high, and are easily accessible for inspection or repair. The platform has been built to accommodate ten equipments, and conduits are run through the concrete for connection to that number.

Each generating unit is controlled from a conveniently located panel mounted in the same room. The control is so designed that a motor-generator can be started by merely pushing a button and from then on the entire operation is automatic. In case of the failure of a.c. power, a control relay on the panel disconnects the battery from the generator circuit. When the a.c. power is resumed, the set automatically starts up again and puts the battery on the line. As soon as the battery is fully charged, it is automatically disconnected and the motor-generator stops, thus doing away with the services of an operator for anything other than connecting the leads to the batteries and starting up the generating apparatus.

The Broadway Department Store garage, in which this apparatus is installed, is particularly well kept and completely equipped and is notable for its cleanliness and the efficiency with which all available space is used.

Unusual battery charging equipment installed in Los Angeles department store garage.

Membership Cards Valuable Assets to Associations

An effective example of cooperation among electrical contractors may be seen in the accompanying reproductions of membership cards of the Electrical Contractors and Dealers' Association of Sacramento and the Alta Electric Club in the San Joaquin Valley. These cards are placed in the offices of the power companies, city electricians, and others who may be called upon to suggest the name of someone who does electrical contracting. Instead of suggesting the name of a particular firm, which might cause embarrassment later, the people in these offices merely hand the inquiring party one of the cards containing the names of all of the members, with the statement that they are all reliable firms, leaving the selection to the individual. This has proved to be a satisfactory method of handling this problem, both from the standpoint of the contractors and the power companies and city officials, as it eliminates any possibility of favoritism and also brings the names of all of the contractors in the association before the prospective user of their services.

Electrical Contractors and Dealers Association of Sacramento

L. W. SHERMAN, Secretary
910 Ninth Street — Telephone Main 918
If no answer, Call Main 1116

F. E. ANDERSON........861 42nd Street
Telephone, Main 3088-J
CAL. MECH. & ELEC. ENG. CO...1110 J Street
Telephone, Main 575
THOMAS DAY CO........1014 28th Street
Telephone, Main 5688
ELECTRIC SERVICE CO........2941 35th Street
Telephone, Capital 41
ELECTRIC SUPPLY CO........814 J Street
Telephone, Main 427
GEO. C. FOSS........531 Oschner Bldg.
Telephone, Main 1189-W
J. C. HOBRECHT CO........K at 11th Street
Telephone, Main 654
LATOURRETTE-FICAL CO........907 Front Street
Telephone, Main 7880
E. M. MILLER........1121 10th Street
Telephone, Main 4667
J. O. MURPHY........1606 Del Paso Bvd.
Telephone, Main 6029
T. L. NIGHTINGALE........2420 F Street
Telephone, Main 3339
CLIFFORD PRUDHOMME........2620 Fifth Avenue
Telephone, Capital 1177
RELIABLE ELEVATOR WKS.....1111 Fifth Street
Telephone, Main 2523
SCOTT PLUMB. & ELEC. CO.....419 J Street
Telephone, Main 2144
STERLING ELECTRICAL CO.....907 8th Street
Telephone, Main 708
CARL. F. VINING........2909 G Street
Telephone, Main 5087
W. H. VOGT & CO........1108 J Street
Telephone, Main 3430
WAXON BROS........1014 J Street
Telephone, Main 241

Membership card of the Electrical Contractors and Dealers' Association of Sacramento.

ALTA ELECTRIC CLUB

DINUBA
Curry Electric Co.
116 South L St. Phone 185

OROSI
Orosi Electric Works
El Monte Way Phone 46F24

REEDLEY
Home Electric Shop
1023 G St. Phone 1942

Reedley Electrical Works.
1621 11th St. Phone 9000

Reedley Plumbing & Electric Co.
1110 G St. Phone 1081

Membership card of the Alta Electric Club in the San Joaquin Valley.

The Stone Electric Company, 710 W. Pico Street, Los Angeles, has recently opened a branch store at 2807 W. Pico Street under the name of Acme Electric Company. A. L. Stone is proprietor of the Stone Electric Company.

Only Minor Changes in the 1925 Electrical Code

Proposed Changes In Article 5 Not Adopted by Code Committee; Principal Changes to Consist of Editorial Revision

The proposed new practices in open and concealed wiring methods, which would require amending of Article 5 of the National Electrical Code, Wiring Methods, Sections 501, 502, and 611, were not adopted by the Sectional Electrical Code Committee of the American Engineering Standards Committee, sponsored by the National Fire Protection Association when it met at the Hotel Pennsylvania, New York, Feb. 17, 18 and 19, to make recommendations covering the 1925 edition of the National Electrical Code.

As A. Penn Denton, chairman of the committee on Article 5 was absent, the report of this committee was presented in three sections. The first section had to do with three-wire, single-phase systems inside of buildings, derived from auto-transformers as balancing coils. This report was referred back to the committee. The second section covered editorial changes. The third section covered the new wiring method which had been proposed; the article committee recommended that it be not adopted. This recommendation was approved.

The article committee proposed and adopted a resolution, "recording it to be the sense of the electrical committee that assemblies of twin and multiple conductors without metallic covering, when the wires with their protective covering are approved by the Underwriters' Laboratories, may be safely used when installed under specific limitations." The sectional electrical committee proposed and adopted "that the drafting of the rules covering the use of approved assemblies of twin and multiple conductors be referred to the committee on Article 5 to cooperate with the Underwriters' Laboratories and present at the next meeting of the electrical committee rules covering the proper use of such assemblies." The principle involved was apparently not denied, but the sectional committee intended to have rules formulated to limit its application, and consequently the question was referred back to the committee and the Underwriters' Laboratories.

There are no radical changes in the 1925 National Electrical Code. The committee's chief work seemed to be editorial revision which would further improve the good work done in producing the 1923 code. This will produce an edition which will be more nearly without conflicts and ambiguous statements, and will be much easier to read and understand.

The recommendations of the sectional electrical committee must be sent to each member of the committee for a mail ballot. After the approval of the members is secured, the recommendations will go before the National Fire Protection Association. They must be reprinted thirty days before this date. The recommendations can be endorsed in open meeting by the National Fire Protection Association. After endorsement the revision will be sent to the American Engineering Standards Committee, which will present it to its membership for mail-ballot endorsement. After receiving this endorsement, the code can be released in printed form, and will become standard.

The following are the more important code changes that were recommended: Details of requirements regardiing the identification of terminals of wiring devices to be inserted in Section 206, to become effective April 1, 1926. In Article 3, Outside Work—Pole Lines, the location of transmission lines with respect to buildings other than central-station plants was specified.

Several details were added to Article 4, Services, relative to the safeguards which must be provided when circuit breakers are used instead of fuses. The use of small circuit breakers instead of fuses on low-capacity circuits was recognized by the committee, provided, however, that it should be approved for the specific purpose before being used. Lead-covered cable must be used for underground service.

The use of a flexible cord of No. 18 gage copper with a 1/64-in. rubber insulation was approved, under Article 6, Conductors. All key sockets of the single-pole type will have to break the center contact instead of the screw shell, under the provisions of the new code, to become effective Sept. 1, 1926. The 1925 Code does not require polarity identification, but if it is used the method is specified as consisting of a contrasting braid on one of the two conductors, and the ground wire shall be the marked wire.

Inclosed Apparatus.

Article 8, Automatic Protection of Circuits and Appliances, provides protection in design or location of all live metal parts. This is another step toward fully inclosed apparatus as a means of protection from accidental contact. The 15-amp. maximum fusing of branch circuits will be continued as no demand has developed for a change. Bare wire will be permitted for a ground under Article 9, Grounding, when the grounding conductor is in a conduit and bonded to the ends of the conduit. The grounded conductor for the grounding of equipment may be of copper or other metal that will not corrode excessively under the conditions that exist. The minimum size of grounding pipe which will be permitted is also specified in another section.

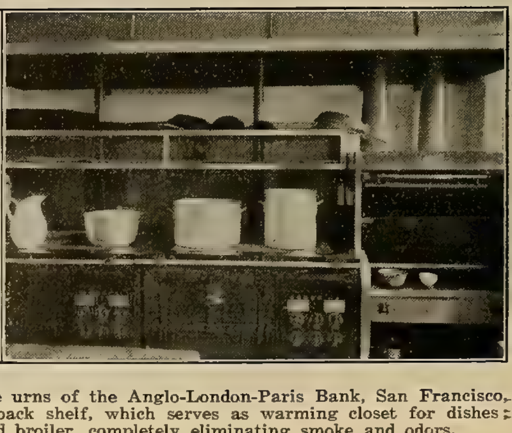
Article 14, Fixtures, Lamp Sockets and Similar Fittings, describes the methods of polarity identification. Fixtures will have to be grounded under several more conditions than provided in the 1923 Code. The remote control of the switch of a range is permitted in Article 16, Heating Appliances. As the result of the study of the technical subcommittee, some changes were made in Article 37, Radio Equipment. Both A and B batteries must be fused with not more than a 15-amp. fuse at or near the batteries. This was the most important change in this section.

Article 39, Theaters, Including Motion-Picture Houses, was changed so that exit-lighting is to consist only of all the lights necessary properly to illuminate the lobbies and other portions to which the public has access. This change was necessary because of practical difficulties met with under the 1923 Code. The use of lightning arresters in Article 40, Small Isolated Plants, was held up pending further study by the committee. The use of static condensers as equipment was recognized in a new provision in Article 50, Systems and Voltages Over 600 Volts. This article now provides something specific and helpful regarding the safeguarding of high-tension lines entering properties other than those of central-station companies.

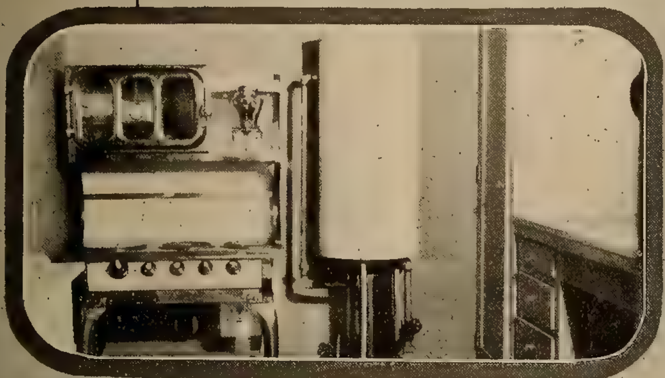
Lighting Service Bureau an Aid to Salt Lake Contractors

The lighting service bureau of the Rocky Mountain Electrical Cooperative League planned an average of 13 jobs per month during the last year; of these, an average of 8 jobs per month was closed. There were 41 outlets per job in the average, and the contractors received an average price of $273.25 for the wiring and equipment. Of the 92 jobs closed, 16 were outside of Salt Lake City, the remaining 76 were Salt Lake City stores, offices, automobile service stations, and churches. Lighting layouts were also furnished for 10 residences.

During June, which was the busiest month for the bureau, 16 installations, having a total of 1,796 outlets, were planned. Of these, 15 jobs were closed, with a total of 533 outlets which amounted to $4,258. Fourteen installations which contained 563 outlets were planned during March. Of these, 10 were closed, with 359 outlets, and approximately $3,274 was paid to the contractors for wiring and equipment. September was not such a busy month from the standpoint of the number of jobs planned, which totaled 11 with 2,082 outlets; however, 6 jobs, containing 1,006 outlets, were closed, from which the contractors received $4,825.



Left, serving tables, steam table and coffee urns of the Anglo-London-Paris Bank, San Francisco, Calif. Right, ranges and broiler. Note back shelf, which serves as warming closet for dishes; also note vents built over ranges and broiler, completely eliminating smoke and odors.



MANY pleasing features are provided in the complete electric home of E. L. Snyder. One group of the lamps on the ceiling fixture shown in the dining room is operated with two three-way switches while the other group is controlled by a single-pole switch. The electric range and water heater in the kitchen are also worthy of particular attention.

Architect Has Complete Electric Home Built for Himself

Having been sold on the advantages of complete electrification, E. L. Snyder, an architect of Sacramento, recently completely electrified his new home at 1111 Forty-third Street, in that city.

In the living room six duplex bracket outlets have been installed with a single switch control, in addition to four duplex convenience outlets and two air-heater outlets. The lighting fixture in the living room as shown in the accompanying picture, consists of two groups of lamps, one group being controlled by a single-pole switch and the other by two three-way switches. The living room also has two convenience outlets, one floor plug and one air-heater outlet. Both the lower and upper halls have center lights controlled by two three-way switches, and convenience outlets. The kitchen is equipped with a Standard electric range and a Wesix water heater with a 3-gallon auxiliary compartment and a 24-gallon boiler. A combination bath and dressing room is supplied with four light outlets, a switch, one convenience outlet, and an air-heater outlet.

The other rooms in the home all contain a goodly number of lighting outlets, controlled by switches, in addition to convenience outlets and air-heater outlets. A total of nine air-heater outlets have been installed, twenty-two duplex convenience outlets, twenty-nine lighting outlets, and four sets of three-way switches; in addition there are a number of single-pole switches, and a bell at the front door and a buzzer at the rear. The rear terrace has been lighted, producing a very pleasing effect.

The home was built by the Brier Construction Company, and the electrical wiring and fixtures were supplied by the Electric Service Company. D. H. McCulloch of that company was largely responsible for selling Mr. Snyder the idea of complete electrification of homes and apartments.

Mr. Snyder has been the architect on a number of electrically equipped homes and apartments which have been constructed in Sacramento recently. His personal experience with the success of this equipment has been an aid to him in having it installed by the owners.

Victor Lemoge, president of California Electragists, never loses an opportunity to display the symbol of the organization. Here it is shown on the front of the Phelan Building, Market Street, San Francisco

Lisle E. Bagwill of The Electric Shop, Morgan Hill, is now a member of the California Electragists.

Electrical Contractor Advertises Through Service Bureau

The Spencer Electric Company of Oakland recently has affiliated with the Homeseekers' Service Information Bureau, installed by Harry C. Knight of that city. This bureau has two objects: first, to sell quality building material for those who are affiliated; secondly, to place the buyer in touch with the buildings erected by a builder of standing who buys any or all materials used in its construction from such quality dealers. An extensive advertising campaign has been planned to run in the daily press, and otherwise to bring the prospective buyer into direct contact with the members of the bureau.

This is a concentrated effort to show the buying public quality buildings at the most reasonable prices obtainable. The services of the bureau are available to any reliable builder in the city. The service is free to the public and has proved an aid to seekers of homes, apartments and business buildings. The expense of providing the service is prorated among the participating members in proportion to the value of the material supplied by them in various installations. The advertising of the bureau has been copyrighted by H. S. Holmes, who is handling the bureau. He expects to develop similar bureaus in other localities.

The West Adams Electric Shop, operated by J. C. Crystal, formerly at 5210 W. Adams Street, Los Angeles, has moved into its new store at 5222 W. Adams Street.

BETTER MERCHANDISING

Motor Story Told with Aid of Traveling Display

General Electric Company Presents Information Concerning New Devices at Dealers' Group Meetings

Striving to give motor dealers a better idea of the general characteristics of new developments made in its line of motors and control equipment, the General Electric Company has been conducting a series of "motor meetings" in the southern part of California. These educational gatherings have been open to dealers, power company men and any other persons who were interested.

The meetings have been addressed by a group of men who were well acquainted with the new devices of the company. In delivering their talks dealing directly with the motors and control equipment these men have used stereopticon views to illustrate the points they wished to bring out. The merchandising of motors also was touched upon in the meetings, and for illustrating the idea of better window displays a model window was erected in front of the audience. This window was of the portable type and could be knocked down for transporting from place to place.

The purpose of the series of meetings was really twofold. In addition to the presentation of data and demonstration of new developments on the motors and control equipment, the company also desired to stimulate the merchandising of these devices. In this latter connection the meetings were arranged to demonstrate to the motor dealers that the merchandising of electric motors need not be in the least unattractive, but on the other hand can be done with a great deal of originality and distinctiveness.

In each city where the meetings have been conducted the General Electric Company man in charge of the territory has acted as the chairman of the meeting and has made all preliminary arrangements. The principal speakers have been secured from the district office and were men who have specialized in particular applications of the devices under discussion.

The recent meeting in San Diego is typical of those conducted in southern California and will give an idea of the manner in which the information was imparted to the audience.

Laying the foundation for effective sales of motors, the meeting was opened by a survey of electrical research as conducted by the laboratories of the General Electric Company. Introduced by E. M. Ellis, sales agent for the territory, S. E. Gates, Los Angeles district manager, brought out this phase of the subject in his discussion on "The Latest Developments of the Research Laboratories of the General Electric Company," with a brief explanation of the policies of the company. The gathering met in the sales display room of the San Diego Consolidated Gas & Electric Company in the basement of the Electric Building. A large crowd of contractors, motor and appliance dealers, electrical engineers, central station representatives and representatives of the street railway company heard the talks and saw the display with enthusiasm.

J. O. Case, assistant manager of the Los Angeles office, followed Mr. Gates' talk with a brief explanation of the policies of the company.

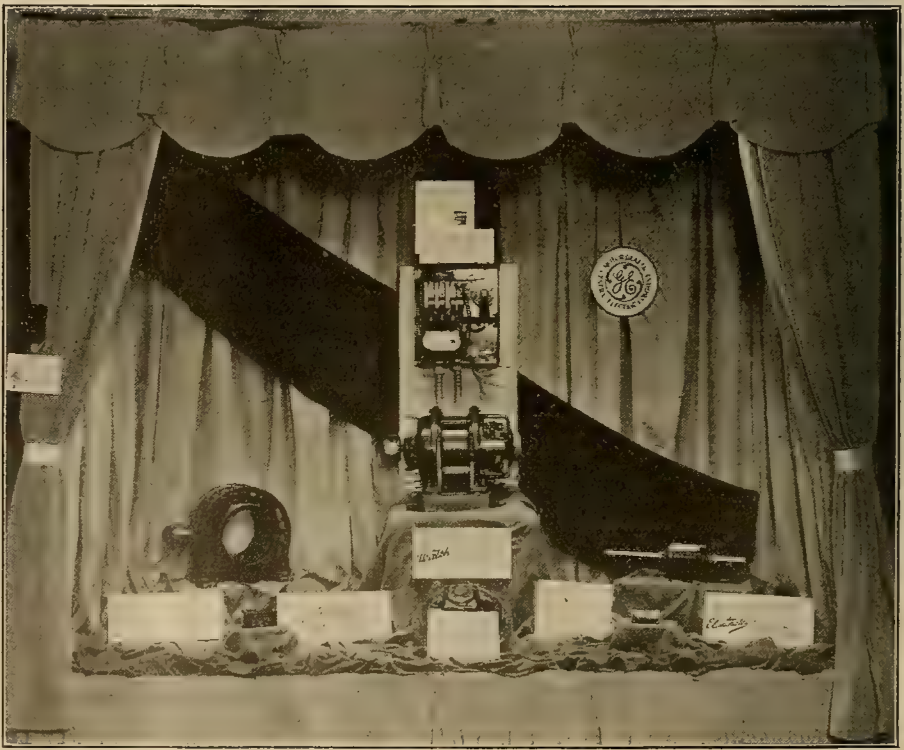
H. C. Hill, motor expert, then spoke of the recent developments made by his company in electric motors. He used two motors to show the points described in his talk and further illustrated his ideas by the showing of stereopticon slides. Mr. Hill explained the superior features of the new motors, giving detailed descriptions of certain important parts.

H. K. Winterer, control specialist, next took up an improved switch, claiming for it greater protection, safety and convenience to the motor operators. He also illustrated his talk by the use of stereopticon slides and presented a demonstration of a control box which had been mounted for the display.

A. L. Spring, representing the motor-merchandising field, spoke of the publicity and advertising campaigns being conducted by his company to familiarize the public with its products, with especial reference to motor sales. Then, to demonstrate that even a window display of electric motors can be attractive and unique, Mr. Spring drew aside the curtain covering a model window in which a display was arranged.

The window had been attractively dressed witih the merchandising cards and display matter put out by the company. In it were a motor and control box. An original touch was added by the placing of a push button on the outside of the merchant's window. Mr. Spring showed how interested window shoppers might touch the button and start the motor in the window, demonstrating the automatic-control feature. A motor, taken apart and each salient feature pointed to by means of ribbons, was also a feature of the display.

A. E. Holloway, commercial superintendent of the San Diego Consolidated Gas & Electric Company, concluded the program by urging dealers to give the fullest instructions possible to those who buy motors. The importance of fitting the right sized motor to each individual plant he also stressed from the central station standpoint, contending that too large a motor for a given plant caused trouble for the power company and was expensive for the customer.



The portable window display used to suggest means of trimming dealers' windows.

Window display of manufacturer's branch office.

Helping the Dealer to Sell Lighting Fixtures

Moe-Bridges Company Maintains Showrooms to Enable Local Dealers to Display Larger Stock of Merchandise

Developments in the selling of fixtures for home use have been such that at the present time customers are demanding a large stock of fixtures from which to make their selections. In a majority of cases the customer, while having some definite idea as to the type of fixture that is desired, will be better satisfied if, before making the final selection, a large variety of types is inspected.

To care for this demand is at times rather difficult for the smaller dealer who, because of lack of space and stock, is unable to show all the fixtures that the customer desires to see. The solution which is accepted by the dealer is that the jobber, from whom he secures his fixtures, will permit him to use the jobbing-house display room for showing fixtures to customers. If the dealer happens to be in one of the smaller cities where no jobber's stock is maintained, this avenue is closed to him and of necessity he must carry his own stock or rely upon catalogs to sell those fixtures which he may not have on hand.

The dealer located in the larger center is in a more favorable position as he may take his customer directly to the jobber's display room and there complete the sale. Jobbers are not the only agency maintaining such displays for the benefit of the electrical industry. Manufacturers of equipment have also established offices and showrooms that are accessible to the dealer. In a majority of cases these showrooms have been fitted up in keeping with the character of equipment on display, with the result that many of them are extremely well adapted to the selling of high-priced merchandise.

An example of the aid which is being given fixture dealers is that offered by the Moe-Bridges Company in San Francisco. This office is maintained as a direct factory branch serving the territory west of Denver. Wholesale trade only is solicited, and a ruling of B. J. Wildman, Pacific Coast manager, provides that sales shall be made only to dealers who, in the opinion of Mr. Wildman, are the only ones entitled to the trade discount.

In its San Francisco office the Moe-Bridges Company has established, in addition to the general sales offices, a group of show rooms in which a complete line of wall, ceiling and portable fixtures may be displayed. There are, in all, three rooms devoted to the displaying of fixtures and a fourth which contains a large stock of glassware.

All of the fixtures on display are placed in locations that will permit the best possible view of the merchandise and all are wired for service. Gangs of switches on the walls of the showrooms enable the salesman to light any fixture that he may desire to show the customer. In order that the fixture display may be up-to-date, the arrangement of the merchandise is being changed constantly, the newer pieces being given the better locations in the showrooms. By thus changing the positions of the fixtures frequently the display does not become a stereotyped exhibit but always presents a different appearance to the customer and gives an impression of the large size of the stock maintained.

These display rooms are open to the dealers at all times, thus giving them auxiliary space and stock which they may show to their customers. The customer may be taken directly from the dealer's place of business to that of the manufacturer and there may be shown whatever fixture he fails to have in stock. The interior of the office maintained by the company is plainly but attractively finished. Walls have been painted in a light cream tone and fittings harmonize perfectly. Attractive window displays are prepared for the show windows and the portable lamps which are shown are changed at regular intervals. Ceiling fixtures of various types are often used in the displays to add to the pulling power of the windows.

A large stock of lamps and glassware is warehoused by the company, much of this stock being kept on the premises. Storerooms are maintained in the basement and on the mezzanine floor, and the shipping and receiving room is in the basement. A spraying room for doing special work is located on the mezzanine floor.

The Broadway Mercantile Company, specialists in the merchandising of washing machines and vacuum cleaners, has moved from its former location at 847 N. Broadway to 2205 S. Grand Avenue, Los Angeles, where it has greater display space.

Interior of fixture showrooms which are always open for use by the electrical industry.

NEWS OF THE INDUSTRY

California Electrical Bureau Advisory Board Meets

Plans and the budget for June Bride Week, to be held June 1-6, were discussed by the Advisory Board of the California Electrical Bureau at its meeting held at the Jonathan Club in Los Angeles, March 27. It was decided that a new set of posters would be prepared to stimulate interest in the sales campaign. The purpose this year will be to focus attention on the first week in June, and in addition to this to conduct a sales campaign from May 15 through June. Prizes will be awarded for the best decorated windows appearing during June Bride Week. In connection with this discussion it was brought out that the idea of an electrical June Bride Week was developed in California through the California Electrical Cooperative Campaign, the predecessor of the Bureau.

The electric home committee presented a recommendation which proposed a new policy to be followed in the manner of selecting electric heating apparatus for homes to be displayed under the Bureau's direction. The plan as presented and adopted provides for a new method of selecting electric air heaters when these are to be of the insert type and are to be permanent parts of the home. Under the new plan when insert heaters are to be used, only one manufacturer's heaters of this type will be used in any one home.

The type of heaters to be used will be chosen by lot before the home is built. As each manufacturer is awarded the installation in a home, his product will be removed from the list of those which have not been used and the heaters for the next home will be chosen from those manufacturers who have not yet had the opportunity of installing their equipment. As soon as every manufacturer who desires to display his product shall have been given the opportunity to do so, all of the names will be grouped and selection will be made from the entire list. The old policy of selecting individual heaters by lot will be maintained where portable heaters are to be used.

The report of the electric home committee was presented, showing that one home had been exhibited since Jan. 1 and that definite plans for the display of seven more had been made. The schedule of the committee calls for a total of twenty electric homes in California during 1925. Following the committee's report, it was given the task of forming a definite policy in regard to whether or not the Bureau would sponsor electric homes erected by individual contractors in small communities. A report is to be made at the next meeting of the Advisory Bureau, to be held in San Francisco April 24-25.

C. L. Chamblin reported to the board on the action taken by the Society for Electrical Development in relation to the institution of the Read Seal wiring plan in California. Definite action on the plan will be taken in the near future.

Among those present at the meeting, which was presided over by R. E. Fisher, chairman, were:

F. J. Airey, W. S. Berry, P. H. Booth, W. F. Brainerd, C. L. Chamblin, H. H. Courtright, C. J. Geisbush, F. E. Elser, W. L. Frost, H. H. Harper, V. W. Hartley, C. T. Hutchinson, Victor Lemoge, Charles Listenwalter, Walter Price, K. E. Van Kuran, F. H. Woodward and D. E. Harris.

Denver Franchise Bid Proposes Reduction in Rates

A reduction in rates to Denver customers is proposed by the Public Service Company of Colorado according to a tentative draft of the new twenty-year franchise which was presented to city officials last week.

Details of the rate revision have not been perfected, according to reports, but assurance has been given by company officials that a reduction of 5 per cent in electric rates and 10 per cent in gas rates will become effective. The saving to customers is estimated at $350,000 annually.

It is proposed that rate changes in the future be governed by the cost-accounting standard of the federal department of labor whereby a barometer of rates is created by striking an average between all necessities of life and the salaries of paid wage earners. The reduction therefore proposed would be merely a base price and could be raised or lowered yearly thereafter by the company under the terms of the proposed franchise.

While the government figure established 149.7 as the base price last year, the Public Service company will consider 150 as the index figure on which future changes may be based. Under this arrangement the rates would be figured as of Jan. 1 each year, the change to be made effective the following April.

Representative business men have been called in by Mayor Stapleton of Denver to confer on the franchise matter, and several have expressed a desire to secure an expert on franchise matters to serve as special counsel for the city. It is understood that Henry E. May, city attorney, is opposed to the tentative franchise.

Neither the city nor the company has taken definite action on the presentation of the franchise, but it is believed generally that it will be submitted at the general city election May 19.

West Coast Power Company Starts Operations in Northwest

Headed by A. Welch, well known among utility operators of the Northwest, the West Coast Power Company, a Delaware corporation, was organized in December, 1924, and maintains its general office at 1101 Gasco Building, Portland. Besides Mr. Welch, president and general manager, the staff of officers includes Robert T. Chambers, Chicago, vice-president; C. F. Cunningham, Newport, Ore., secretary; and R. H. Walton, Chicago, treasurer.

The company has acquired the entire assets of the General Light & Power Company, serving Newport and Toledo, Ore., and near-by beach resorts, and also Shelton, Wash.; the Waldport Lighting Company, serving Waldport and Bayview, Ore.; the Florence Electric Company, serving Florence, Glenada, Cushman and Acme, Ore.; and the Shorey Light & Power Company, serving Reedsport and Gardner, Ore.

The Newport district is served by power purchased from the Pacific Spruce Corporation mill at that city; at Waldport, service is supplied by a 200-kw. hydroelectric plant with a 100-kw. diesel engine standby. The Florence property has two diesel engines with a total capacity of 200 kw.; while at Reedsport, 250 kw. in diesel engines supplies the demand. Plans are formulated for the immediate connection of the Florence and Reedsport properties by a 22,000-volt transmission line approximately 31 miles long, and the installation of a 750-kw. steam plant at Reedsport is also planned for this year. Later the company contemplates tying in the Newport and Waldport properties and eventually connecting its entire Oregon system by a line from Waldport to Florence.

The Shelton, Wash., property is served by a 300-hp. steam plant supplemented over the peaks by a 150-kw. hydroelectric plant. Arrangements have been made by the West Coast Power Company to purchase surplus power from the Reed-Simpson lumber interests and the McCleary Lumber Company, both with large mills under construction at Shelton, to be electrically driven from a central steam power plant.

Four-State Columbia River Compact Authorized by Congress.—A bill, previously passed by the senate, designed "to permit a compact or agreement between the States of Washington, Idaho, Oregon and Montana respecting the disposition and apportionment of the waters of the Columbia River and its tributaries and for other purposes," was adopted by the House of Representatives on March 3. The treaty is to be entered into before Jan. 1, 1927, and is to cover irrigation, power, domestic and navigation uses of the river's waters.

First Unit of Seal Beach Plant Is Nearing Completion

With construction work ahead of schedule, the first unit of the new electric station being erected at Seal Beach by Dwight P. Robinson, Inc., for the Los Angeles Gas & Electric Corporation steadily is nearing completion. The ultimate capacity of the entire plant is planned to be 288,000 hp., comprising six units. The work now in progress consists of buildings sufficient to house two turbo-generator units. One of these with a capacity of 36,000 kva. is expected to be in operation not later than July 1, 1925. This unit is now about three-fourths completed.

One of the unusual features of the plant will be the three large reinforced concrete stacks, each 375 ft. in height. The stack, which will serve the boilers of the first two units, is now more than two-thirds finished. The steam boilers are of Babcock & Wilcox construction and are adapted to burning either natural gas or oil. The three boilers of the first unit of the station are each capable of generating 175,000 lb. of steam per hour continuously at 385 lb. gage pressure. These are reputed to be the largest units on the Pacific Coast. Each boiler will be equipped with a forced-draft fan which will draw air from out-of-doors through a pre-heater. The pre-heaters will use heat from the stack gases that is ordinarily wasted and will raise the incoming air to 300 deg. F. Steam from the boilers will pass through superheaters and be raised to a temperature of 700 deg. F. to permit the greatest steam efficiency in the turbines.

The generator is of a new type of construction recently developed by Westinghouse engineers. The type has been used successfully for a number of months in the East, but the one being installed in the Seal Beach Station of the Los Angeles Gas & Electric Corporation is the first of its kind west of Chicago.

The generator turbine has a maximum capacity of 48,000 hp. and an operating speed of 1,800 r.p.m. It requires 140 tons of steam per hour to operate it at full load. The generator voltage is 13,200 volts. Transformers will raise this to 110,000 volts for transmission over a steel tower line approximately 24 miles to Los Angeles. A new substation is to be built as close as possible to the system load center to distribute the power from the new plant.

Recent view of Seal Beach plant of the Los Angeles Gas & Electric Corporation

Emergency Act Provides for Tax on Utility Earnings

As a piece of emergency legislation designed to help supply a deficiency of funds from taxes available to meet the state budget in the coming biennial period, the Oregon State Legislature has passed an act providing that each public utility and railroad operating in the state pay a tax based on the amount of annual gross revenue of such utility or railroad. The act is temporary in character and automatically expires at the end of the current biennial period. The money so raised is to go into the general fund of the state.

The tax, which is payable annually at the time of filing with the Public Service Commission of Oregon the annual financial statement, or report required by law, is in the form of a certain fee, not a percentage, graduated upwards as the gross earnings of the individual company fall within certain definite limits. For instance, there are twelve different fees ranging from $10 in the case of the company having annual earnings of less than $5,000, to a fee of $3,000 in the case of the company having earnings in excess of $6,000,000. The act will raise about $40,000 annually or $80,000 in the biennial period.

New Corporation Formed to Distribute Ohio Vacuum Cleaners.—The Easy Electric Housekeeping Corporation is the name of a new concern in San Francisco recently incorporated by W. A. Hawley, formerly Pacific Coast representative of the Hoover Suction Sweeper Company, and J. Lee Richards, formerly Western sales manager for the Syracuse Washing Machine Corporation. Mr. Hawley is president and general manager, and Mr. Richards vice-president and treasurer of the new company, which will act as Pacific Coast distributors for the United Electric Company, Canton, Ohio, manufacturers of the Ohio vacuum cleaner. The firm is incorporated for $100,000 and is a close corporation. Sales headquarters have been established at 1003 Market Street.

Legislatures Discuss Approval of Colorado River Pact

Approval of the Colorado River Compact was given by the legislature of Arizona when a concurrent resolution, containing certain reservations concerning the allocation of water between the lower basin states of Arizona, California and Nevada, was passed on March 11. According to the resolution passed by the Arizona legislature, it must be accepted and approved by the legislatures of California and Nevada by March 15, 1927. On March 24 Gov. G. W. P. Hunt vetoed the resolution.

The reservations included in the Arizona approval of the Colorado River Compact in relation to the apportionment of the water of the Colorado provide that: (1) to Nevada shall be alloted out of the apportionment to the lower basin all of the water which reasonably can be applied within the state to domestic and agricultural uses; (2) the remainder of the water apportioned to the lower basin is to be divided equally between the states of Arizona and California, for application to domestic and agricultural uses in each state; (3) the right of the lower basin to increase its beneficial use of water from the Colorado by 1,000,000 acre-ft. per year shall accrue to Arizona solely, provided that this right shall exhaust Arizona's claim to the waters of the Colorado River system entering the Colorado within Arizona below Lee's Ferry; (4) water to be delivered to Mexico shall be apportioned first from the surplus flow of the Colorado over and above that apportioned to the upper and lower basins, and if a greater quantity is required the burden of supplying the water as regards the lower basin states shall be in proportion to the apportionment of the water assigned to the three states as in (1) and (2) above.

A legislative commission to negotiate with similar commissions from California and Nevada was authorized in the resolution.

While the discussion on the ratification of the original seven-state compact has been considered by Arizona, the other six states interested in the development of the Colorado River have been considering the ratification of the compact as a six-state agreement (Journal of Electricity, March 15, 1925, p. 222). The resolution to make the Colorado River Compact binding upon the signatory states when six states shall have ratified it, as proposed by Colorado, has been accepted by Colorado, Wyoming and Utah. A similar resolution with the reservation that to make its ratification valid the federal government provide storage in the upper basin of the Colorado has been passed by the California assembly and will be considered by the senate in the near future.

Great Northern Railway to Start Electrification of Western Division.—Initial steps toward the electrification of the Great Northern Railway's line across the Cascade Mountains in Washington have been taken by the company in moving the terminal for the transfer of through freight from Skykomish to Everett. The first section to be electrified will be that between Skykomish and Tye, on the western slope of the mountains. The greater part of the preliminary and location work has been completed.

Guy W. Talbot to Head Northwestern Electric Co.

New Board of Trustees Elects Officers and Transfers Executive Headquarters from San Francisco to Portland

Following the purchase of the Northwestern Electric Company, Portland, by American Power & Light Company interests, (Journal of Electricity, March 1, 1925, p. 184) the annual meeting of the stockholders of the Northwestern Electric Company held at Vancouver, Wash., March 18, 1925, resulted in the election of the following to the board of trustees: Guy W. Talbot, John A. Laing and Emery Olmstead, Portland; M. M. Connor, Vancouver, and Herbert Fleishhacker, San Francisco. Of the old board, the members that retire are Mortimer Fleishhacker, A. N. Baldwin and R. E. Wallace, San Francisco.

On the same day the new board met and elected the following officers: Guy W. Talbot, president; John A. Laing, vice-president; L. T. Merwin, vice-president; George L. Myers, assistant to the president; C. W. Platt, secretary and treasurer, and A. N. Cudworth, assistant secretary and assistant treasurer. Messrs. Talbot, Laing, Myers and Platt hold the same positions in the Pacific Power & Light Company and the Portland Gas & Coke Company, other American Power & Light Company properties in the Northwest, while Messrs. Merwin and Cudworth retain the same positions that they have held with the Northwestern Electric Company.

The preferred stock selling activities of the Northwestern company will be carried on by the investment department that handles the preferred stock sales of the Pacific company and Portland Gas company, under the direction of the present manager of that department, S. E. Skelley. Under these changes in organization, which are all that thus far are contemplated, each company retains its individual identity, the principal effect of the purchase being the moving of the executive headquarters of the Northwestern Electric Company from San Francisco to Portland.

Mr. Talbot has announced two important matters of policy bearing on the future construction program of the allied companies. These long have had a physical inter-connection across the Columbia River between the Powerdale plant of the Pacific company on the Hood River in Oregon and the Condit plant of the Northwestern company on the White Salmon River in Washington. The first of these is that the needs and the power production facilities of both companies will be studied jointly before proceeding with any development of additional generating capacity. It is generally understood that, when this development is undertaken, it will be probably either on the Lewis River in Washington at a site controlled by the Northwestern company, or on the Deschutes River in Oregon at a site controlled by the Pacific company.

The other announcement is that plans are being formulated for the construction of a transmission line connecting the tied-in power systems of the two companies adjacent to the Columbia River with the Yakima-Walla Walla power system of the Pacific company in eastern Washington. When this line is built, there will be an unbroken transmission line from western Montana to Portland over the lines of the Montana Power Company, The Washington Water Power Company, the Pacific Power & Light Company and the Northwestern Electric Company. Several routes are under consideration, and no decision has been reached.

Removal of Commission Control of Utility Rates Sought

The Los Angeles city council is seeking the cooperation of other cities and towns of California in a movement to take the control of rates of public utilities out of the hands of the California Railroad Commission. To that end the following resolution, introduced by Fred C. Wheeler, councilman, was adopted at a meeting of the council held Feb. 10, 1925:

WHEREAS, Great dissatisfaction exists in Los Angeles and the state at large, over many decisions of the State Railroad Commission, wherein great public utilities corporations, such as electric companies, gas, water and telephone companies, have been granted rates which the public believe to be out of proportion to the service rendered, as instanced by their late decision in which they granted the Southern California Telephone Company heavily increased rates for an inferior and unsatisfactory service, and

WHEREAS, These decisions are coming with frightful regularity, and if continued, the people will be heavily handicapped by these intolerable increases. Therefore be it

RESOLVED, That this city invite other cities and towns to join us in presenting to the Legislature such measures as will allow the people of the state, including cities and towns, to set the rates to be charged for gas, water, electricity and telephones, to the end that fair and equitable rates be maintained.

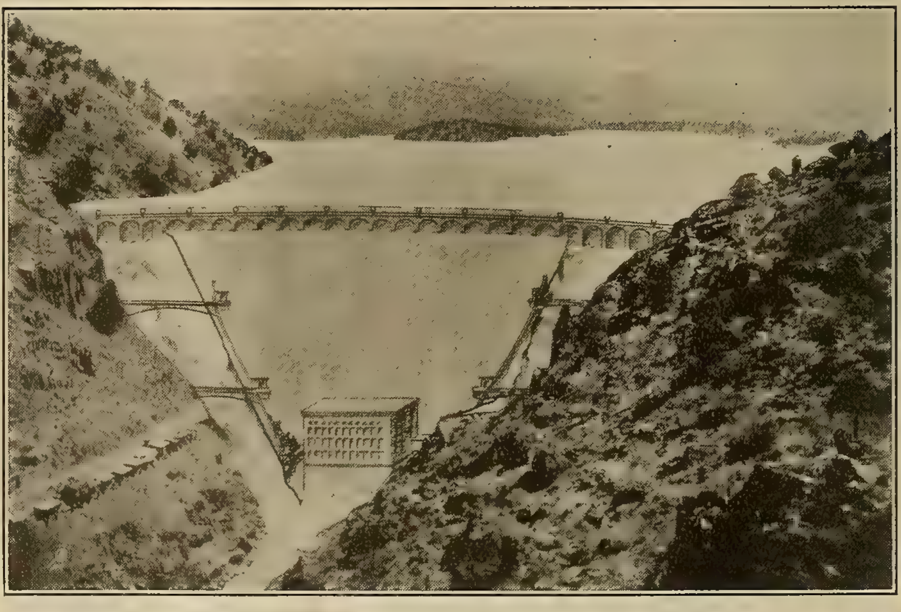
Copies of this resolution have been mailed to various towns and municipalities.

Associated Manufacturers of Electrical Supplies to Meet in June.—The annual meeting of the Associated Manufacturers of Electrical Supplies will be held at Hot Springs, Va., during the week beginning June 8.

Power-Irrigation Development Planned in California

At a joint meeting of the boards of directors of the Oakdale and the South San Joaquin Irrigation Districts held in Manteca, Calif., March 18, it was decided to take immediate steps to ask the State Bond Commission to ratify an agreement made last January by the two districts with the Pacific Gas and Electric Company, San Francisco, as lessor of the Sierra & San Francisco Power Company. Under the terms of this 40-year contract, the irrigation districts will build a reservoir at Melones on the Stanislaus River in Calaveras County to impound about 100,000 acre-ft. of water. The power company will build a power plant of 30,000-kva. capacity to cost approximately $1,500,000 and will pay the irrigation districts approximately $125,000 a year for forty years for the water used from the proposed reservoir. Any surplus over storage requirements will go to the power company. It is believed that the yearly payments will be sufficient to pay the interest on the $2,200,000 bond issue, which will be necessary for the construction of the dam and to pay off the bonds at the end of forty years. Plans call for the issuance of $1,100,000 in bonds by each district, and petitions will be circulated at once to secure the signatures necessary for submission of the matter to the people at an election. Construction of the dam and power plant is expected to begin upon ratification of the bond issue.

B. C. Company May Extend Transmission System to Serve Vancouver Island Cities.—The cities of Duncan and Ladysmith, and the Nanaimo Heat & Power Company, Nanaimo, B. C., all on Vancouver Island, have entered into negotiations with the British Columbia Electric Railway Company, Ltd., for the purchase of electric energy. The latter company now is investigating the possibilities in the several cities, with a view to installing a 66,000-volt transmission system. The cost of the system, it is said, would be in the neighborhood of half a million dollars.



Artist's drawing of Exchequer Dam and power house of the Merced Irrigation District, on the Merced River, in the center of the San Joaquin Valley, California. The dam is to be 310 ft. high, and the installed capacity of the plant will be 30,000 kw. It is expected that the project will be completed by May, 1926.

Five Western Utilities Share in $22,948,000 Budget

A total of $22,948,000 will be expended for construction during 1925 on the public utility properties controlled by the Standard Gas & Electric Company, according to a recent announcement of H. W. Fuller, vice-president in charge of engineering and construction, Byllesby Engineering & Management Corporation.

Western companies for which construction plans have been made and the improvements contemplated for each follow:

San Diego Consolidated Gas & Electric Company—Construction of an intake tunnel and screen house for condenser and boiler feed system, preliminary to installation of a 20,000-hp. turbo-generator; extensions to underground distributing system; installation of additional switching facilities in power stations and substations.

Western States Gas & Electric Company, Stockton, Calif.—Installation of additional transformers and switching facilities in Station A; improvements to substations in Stockton, Lodi, Altaville and Elk Grove, and to gas plant and garage in Stockton; installation of additional switching and transformer facilities at Richmond substation, and of spare transformers at Eureka and Trinity River plants.

Mountain States Power Company, Albany, Ore.—Building of new 66,000-volt transmission lines between Albany and Springfield via Corvallis, and between Independence and Salem, with necessary switching facilities at terminals and intermediate points.

Southern Colorado Power Company, Pueblo—Building of a 60,000-volt 60-cycle transmission line between Pueblo and Canon City to facilitate exchange of power between plants at those points, with necessary changes in substation facilities; extensive improvements to transmission lines in the La Junta-Rocky Ford district.

Coast Valleys Gas & Electric Company, Salinas, Calif.—Construction of a new substation in that city, designed to take care of local distribution as well as incoming 66,000-volt transmission lines; improvements to gas plants at Salinas and Monterey. (Journal of Electricity, March 15, p. 224.)

Nation-wide Industrial Lighting Campaign Plan of N.E.L.A.

A nation-wide industrial lighting campaign will be carried on in the fall, according to plans made at a meeting March 17 at the National Electric Light Association's headquarters in New York called by J. F. Becker of the United Electric Light & Power Company of that city and chairman of the industrial lighting committee of the Commercial National Section. Forty-seven representatives of central stations, manufacturers and national organizations were present.

An executive committee consisting of J. F. Becker, chairman; G. M. Moore, treasurer; L. H. Rosenberg, secretary; and five others will direct the Industrial Lighting Activity, and a committee of from twenty-five to thirty representatives of all branches of the electrical industry interested in industrial lighting and of other industries interested in better and safe production in manufacturing plants will be appointed by Mr. Becker to carry out the program outlined. A committee chairman will be appointed for each of the twelve geographical divisions of the National Electric Light Association.

A plan book detailing the complete campaign will be distributed. According to the plan endorsed, an advertising campaign will be conducted in national, business and industrial magazines in order to interest plant executives in better industrial lighting and to assist local groups in the industrial cities in their efforts to stimulate the use of better plant lighting. Local groups will consist of existing electrical leagues, or committees may be formed by local members of the electrical industry to carry on the work.

In addition to the national advertising, direct-mail material consisting of several broadsides to be mailed to prospects will be furnished the local groups; lecture and demonstration service will be provided and men sent into the field to assist in the solving of local problems. The national committee will supply also suggestions for local newspaper advertising; for demonstrations of the proper equipment for factory lighting; for laying out model industrial plants; and for planning actual specifications for the relighting of such plants.

Expenses of the national advertising and organizational work will be borne by manufacturers of reflectors, lamps and similar equipment. The costs of the local campaign will be taken care of by the local groups.

Santa Paula Man Is Awarded Resuscitation Medal

J. M. Buswell, designated by Samuel Insull as his personal representative, was the guest of honor at the annual meeting of the Chamber of Commerce, Santa Paula, Calif., Jan. 16, when he awarded to C. G. Gaertner the Insull gold medal for resuscitation.

On Nov. 15, 1923, K. E. Kincaid was doing some work in the Santa Paula substation of the Southern California Edison Company when he lost his footing and came in contact with a 15,000-volt bus-bar. Mr. Kincaid immediately became unconscious and appeared to be dead. Mr. Gaertner immediately set about using the Schaefer prone-pressure method of resuscitation and, after ten minutes of doubt, signs of life appeared. Soon after Mr. Kincaid was breathing naturally and was transported to the hospital where he was treated for burns.

The case was cited to the National Electric Light Association, which is authorized by Mr. Insull to make these awards.

Certificate of Insull medal award, Insull gold medal and C. G. Gaertner receiving medal from J. M. Buswell

Prizes for Sales Helps Suggestions Announced.—The United Electric Company, Canton, Ohio, has announced a prize contest in which $1,000 in cash prizes will be awarded to dealers for suggestions on dealer or sales helps that the dealer believes will be most helpful in stimulating sales. The aim of the contest is to secure sales helps which the dealer can and will use in increasing his sales.

Permits Covering Western Sites Granted by Commission

A preliminary permit for one and a half years has been granted by the Federal Power Commission to the El Dorado Power Company, San Francisco, covering a proposed hydroelectric power project at China Flats site on the Silver Fork of the South Fork of American River, in El Dorado County, Calif. The project, which is located entirely on public lands within the El Dorado National Forest, will be developed in three steps. At first only the natural flow of Silver Fork as modified by existing storage of Twin and Silver Lakes will be utilized. As the demand for power increases, the storage capacity of Silver Lake reservoir will be increased from 5,000 to 25,000 acre-ft.; finally a dam forming 7,500 acre-ft. of storage on Silver Fork will be constructed, according to plans outlined. The capacity of the site is estimated at 7,000 hp.

The Southern Colorado Power Company, Pueblo, has been granted a three-year preliminary permit. This covers a proposed hydroelectric power project on Grape Creek, a tributary of Arkansas River in Fremont and Custer Counties near Canyon City, West Cliff and Silver Cliff, Colo. The development, as planned, provides for two reservoirs. The first, which will be formed by the construction of a dam about 6 miles below West Cliff, will have a capacity of 97,000 acre-ft. and be connected by a conduit about 12,000 ft. long to a power house downstream designed to generate about 7,500 hp. at a 900-ft. head. The second reservoir will be formed by a dam 6 miles above the mouth of Grape Creek. It will store about 15,000 acre-ft. of water and will be connected by an 8,000-ft. conduit to a power house of about 6,000-hp. capacity at a 700-ft. head.

California Electrical Bureau Presents Annual Report

The annual report of the California Electrical Bureau, formerly the California Electrical Cooperative Campaign, has been published and distributed to the membership of the association. The report, which is the seventh of its kind, also contains an historical record of the organization. Included in the 1924 report are data on the activities of the association during the past year. This report covers: the Adequate Wiring Program; the Better Illumination Program; and the Sales-Stimulation Program.

Under the wiring program plans for a large number of homes were supervised, and a considerable quantity of the model wiring plans were distributed to interested parties. Cards bearing the inscription, "This Home Is Equipped with Electrical Convenience Outlets" were placed on homes in the course of construction that had one or more convenience outlets.

Six electric homes were displayed under the auspices of the Bureau, and it assisted in the exhibiting of several others.

To stimulate better lighting an industrial lighting exhibit was maintained in the Los Angeles Chamber of Commerce and was demonstrated to 266 industrial plant superintendents. The portable window lighting exhibit was shown in several different cities throughout California. A number of plans for lighting were laid out and surveyed by the Bureau, witih the result that better lighting was installed in the buildings. The Bureau also served as the distributing organization of the Better Home Lighting Contest material.

June Bride Week was sponsored by the Bureau as the principal activity under the sales-stimulating program. Material assisting dealers to call the attention of the public to the appropriateness of electrical gifts for the June bride was prepared and distributed free. Eleven cash prizes aggregating $100 were distributed among the dealers having the best window displays for the week. Newspaper advertising calling attention to June Bride Week appeared in 150 papers throughout the state. During the Christmas season of 1924 the Bureau staff assisted dealers in displaying merchandise through the use of manufacturers' sales helps. No material was prepared by the cooperative organization for the Christmas trade.

Plans for 1925 include the erection and display of twenty electric homes within the state. At the present time one of these has been exhibited already, and six more are definitely scheduled. Those for which arrangements have been made are as follows: Santa Barbara, April 15-25; El Centro, May 1-10; San Francisco and Los Angeles, May 10-17 (in conjunction with Better Homes Week); San Diego, May (date not definite); Santa Cruz, July 17-26. A home at Sierra Madre, open from Jan. 29 to Feb. 4, was visited by 3,500 people.

Thirteen more homes will be opened during the coming year. They will be located at points where the best connections can be made. Negotiations now are being conducted in the following cities: Santa Ana, Monrovia, Long Beach, Redlands, Alhambra, San Bernardino, Pomona, Bakersfield, Fresno, Stockton, Modesto, San Luis Obispo, Petaluma, Chico, Marysville, Eureka, and in San Mateo and Marin Counties.

The budget for the coming year shows that $50,000 will be necessary to carry on the work planned. Manufacturers, jobbers and contractors will be solicited for $20,000 of this, the balance to be subscribed by the central station companies and retailers.

Electrical Jobbing House Opens New Establishment in Oakland

The Union Electric Company has recently been incorporated in Oakland and has established an electrical supply jobbing house at 121-123 Tenth Street. The company has a complete stock of wiring materials and supplies and will serve the electrical contractor-dealers of central California. Some of the better known material to be stocked will include Wiremold, Buckeye conduit, T. V. externally operated switches, Pass & Seymour schedule material, and Wheeler R. L. M. reflectors. F. G. Booskirk is president of the concern. He was formerly western manager for Albert Wahle Company, and has been in the electrical industry since 1912. Frank H. Mills, secretary-treasurer, was formerly with Allied Industries, Inc., San Francisco; for twelve years prior to that he was with the Electric Appliance Company, San Francisco. E. A. Peterson is vice-president of the concern. Robert King is the outside salesman for the company. He has been an electrical contractor in Oakland for a number of years and is well known among the members of the industry. He formerly operated the King Electric Company.

Publicly Owned Utilities May Be Taxed in California

Taxation of publicly owned utilities in California is proposed in a bill now pending before the legislature of that state. The measure provides that these utilities pay a tax based on gross revenue equivalent to that paid by privately owned utilities under the King tax bill. The bill has been reported out of committee, but no action had been taken up to March 25.

As the bill would be a constitutional amendment, if passed by the legislature it will be subjected to referendum vote of the people of California at the general election in 1926. The bill is being sponsored by the farm organizations of the state and is being opposed by the cities having municipal systems. The farmers claim that the cities in which municipal systems are operating are evading state taxes on these utilities, thus increasing the indirect taxes falling upon farming and industry. A similar bill appearing as an initiative measure on the general ballot in November, 1922, was rejected by the voters of the state.

To Observe Better Homes Week During Month of May

To stimulate interest in home-building throughout the country the week of May 10-17 has been designated as "Better Homes Week." Exhibits of modern homes have been planned for the leading cities of the United States. These homes will be displayed under the auspices of the women's clubs in the various cities, and it is the purpose of the leaders of the movement to have the houses modern in every respect.

Homes will be exhibited in both San Francisco and Los Angeles. The San Francisco home is being erected in Balboa Terrace and will be exhibited under the auspices of the San Francisco City and County Federation of Women's Clubs. The San Mateo County women's clubs will cooperate with the San Francisco association in displaying the home. The home will be completely electrical. The cooperation of the California Electrical Bureau has been requested by the women's organizations, and during the time that the home is open for inspection a representative of the bureau will be present to demonstrate the electrical equipment installed. Similar arrangements are being made for the home in Los Angeles.

The San Francisco home was planned by the California Electrical Bureau, and upon the suggestion of the representatives of the Better Homes Committee was turned over to the federation for the purpose of display. It is probable that the home planned for Los Angeles will be treated in a similar manner.

Value of Western Plants Agreed Upon.—An agreement has been reached between the Federal Power Commission and the Western States Gas & Electric Company, Stockton, Calif., whereby $1,898,365 is to be regarded as the fair value of its Placerville plant on the South Fork of American River in El Dorado County, Calif. Similar agreements have been entered into with the San Joaquin Light & Power Corporation. The fair value of its Kerckhoff plant on the San Joaquin River is fixed at $6,166,206, while $2,097,230 is agreed upon as the fixed capital account of the project as of Dec. 31, 1922.

News of the Electragists

State-wide California Electragists Society Formed

Southern California Association of Electrical Contractors and Dealers Unites with California Electragists

A state-wide organization of California Electragists is a reality following a meeting of an executive committee representing the Southern California Association of Electrical Contractors and Dealers and a similar committee from the former body of California Electragists from the northern part of the state. The meeting was held in Los Angeles March 26. Those present representing the Southern California Association of Electrical Contractors and Dealers were F. E. Elser, Los Angeles; Frank McGinley, Harbor Electric Company, Wilmington; J. F. Zweiner, San Diego; C. W. Jones, Pomona Fixture & Wiring Company, Pomona; J. J. Farley, Farley Electric Company, Fullerton; and C. J. Geisbush, executive secretary. The California Electragists from northern California were represented by Victor Lemoge, president; Walter F. Price, executive secretary; C. L. Chamblin, California Electrical Construction Company, all of San Francisco; and H. H. Courtright, Valley Electrical Supply Company, Fresno. W. F. Brainerd, California Electrical Bureau, Los Angeles, also attended the meeting.

Frank McGinley was appointed temporary chairman of this joint meeting and Walter F. Price secretary. A letter of formal application from the Southern California Association of Electrical Contractors and Dealers was presented requesting affiliation for the entire membership of 133 with the California Electragists. This application was unanimously accepted. In the absence of H. H. Walker, president of the southern association, who is ill and will not be able to take an active part in association work for several weeks, F. E. Elser informed the meeting he had been elected spokesman of the southern organization. Mr. Elser suggested that, although the northern California members had agreed to give the first year's presidency to the south, the present officers continue to serve; and that the president be elected from the southern division at the next meeting of the executive committee. This suggestion was concurred in by the other members, and the chair was turned over to President Lemoge.

The plan of affiliation that was adopted provides for one California association to be known as the California Electragists, with two divisions, one in Los Angeles for the southern division and one in San Francisco for the northern division. The executive committee will be composed of an equal number selected from each of the executive boards of each division. This committee will meet quarterly or semi-annually and will elect the state chairman for the coming year at its first meeting each year. The general management of the organization will be vested in this committee, and it will determine the distribution of the association funds based on budgets of each division.

Each division may secure additional funds as it sees fit, and will have complete jurisdiction over the expenditures in its division. The executive board of each division will direct its own field activities and arrange its own quarterly and annual meetings in line with the general policy of the executive committee. Members from either division will be welcome at all the meetings, but will not be expected to attend meetings other than those of their division because of the distance separating the two divisions.

Membership in the California Electragists will provide full membership in the Association of Electragists, International, license to use the name Electragist, and limited data service. The executive board of each division shall determine who shall be eligible to membership. The A.E.I. has agreed to accept no new members from either division unless the application comes through the California Electragists.

Each division may permit local district organizations to be formed within its division. However, even though all the members of a local association are Electragists, they cannot use the word Electragists in the title of the organization without securing the approval of the executive committee.

Dues in the California Electragists will be uniform over the entire state, to wit: $12 per year where the gross annual business is less than $20,000, and $24 per year if over $20,000. Application blanks must be signed by each new member before the A.E.I. will issue an Electragist license.

The southern division office is temporarily located in the office of the California Electrical Bureau, 631 Cotton Exchange Building, Los Angeles. C. J. Geisbush is executive secretary. Applications for membership, requests for supplies or services, or inquiries relative to the California Electragists from within the southern division should be made to Mr. Geisbush.

The northern division office is located at 318 Call Building, San Francisco. Walter F. Price is executive secretary. Until the election of a new president he will continue to deal with the New York office of the A.E.I., sending in the dues for all state members, etc.

F. E. Elser of Los Angeles was appointed by President Lemoge to represent the Electragists of the southern division on the advisory committee of the California Electrical Bureau during the illness of H. H. Walker.

The California Electragists have offered to assist the California Electrical Bureau in the execution of the Red Seal Plan of electrical wiring as soon as definite arrangements are made for handling the plan in California.

Boblet Manufacturing Company, 628 Main Street, Chico, has become recently a member of California Electragists.

Association of Electragists Elects New President

Joseph A. Fowler, Fowler Electric Company, Memphis, Tenn., has been elected president of the Association of Electragists, International, succeeding James R. Strong, who has retired from active leadership after serving the Association for many years. Mr. Fowler has been an active worker in association work for years. He was executive committeeman from the southern division, and has been chairman of the committee on liability insurance. He also was secretary of the state association of Tennessee.

JOSEPH A. FOWLER

Pacific Division Executive Committeeman Attends Meeting of Association of Electragists, International.—Clyde L. Chamblin of the California Electrical Construction Company, San Francisco, attended the semi-annual meeting of the executive committee of the Association of Electragists, International, held in New York, March 16 and 17, as the executive committeeman from the Pacific division. He also attended the annual meeting of the board of directors of the Society for Electrical Development held on March 20. Mr. Chamblin is a director representing the contractor-dealer group. He went by the way of Detroit, where he visited the plant of the Ford Motor Company as a guest of Ernest McCleary, executive committeeman from the Great Lakes district. He returned through Los Angeles where he attended a meeting to complete the details of a unified association of California Electragists.

California Electragists to Hold Quarterly Meeting in Visalia.—Announcement just has been made that the next quarterly meeting of the California Electragists will be held at the Hotel Johnson, Visalia, on Saturday, May 9, 1925. Details of the meeting will be announced in the near future.

Frank Sherman, electragist of Corning, Calif., recently spent a week in San Francisco. While there he attended a meeting of the San Francisco Association of Electrical Contractors and Dealers.

Electrical Construction Company, 110 North School Street, Lodi, recently has become a member of the California Electragists.

H. W. Jacobs, electrical contractor of Santa Rosa, was a recent visitor to San Francisco.

Illuminated testimonial which was presented to James Remsen Strong, retiring president of the Association of Electragists, International.

James Remsen Strong Retires as Electragists' President

As an expression of the high regard in which James Remsen Strong, retiring president of the Association of Electragists, International, is held by his fellow members in the electrical profession, an illuminated testimonial was presented to him by the association at a dinner given in his honor March 16 at the Building Exchange, New York City. The dinner was attended by seventy-five of the leading men of the industry.

Mr. Strong has held the office of president of the association from 1905 to 1908 and from 1921 until now. Among the speakers who told of his long record of unselfish service were Samuel Hilton of Syracuse; John Hatzel, president of Hatzel & Buehler, Inc., New York, both charter members of the organization; Ernest McCleary, second president of the A.E.I. and present executive committeeman; Charles L. Eidlitz, first president and now head of the New York Electrical Board of Trade, and William L. Goodwin, of the Society for Electrical Development. The testimonial was presented by Mr. Eidlitz.

Joseph A. Fowler, newly elected president of the Association of Electragists, International, presided as toastmaster.

Vital Message to Contractors in President's Statement

Joseph A. Fowler, newly elected president of the Association of Electragists, International, issued the following statement following the executive committee meeting of the Association recently held in New York:

"That there may be no question concerning the attitude of the Association of Electragists, International, your executive committee on March 17 unanimously agreed that the only trade policy that can be justified as economically sound is that the distribution of electrical merchandise should be from manufacturer through jobber to contractor and dealer to consumer.

"This determination of your executive committee follows the investigations of our trade policies committee which brought out some of the evils surrounding the orderly distribution of electrical materials.

"For some time contractors and contractor-dealers have complained bitterly about the practice of manufacturers and jobbers bypassing them at equal or even lower prices.

"The existence of this situation is not denied but the counter charge is made that the contracting branch of the industry has not kept its skirts clean nor has it had a definite policy. It must be admitted that many contractors and dealers have sought to eliminate the jobber in obtaining their supplies.

"We have thus recognized the orderly principle of distribution which has been intrumental in building electrical business. Without this direction to the movement of supplies there can only be incrimination, price cutting and bad feeling.

"Any break down of this principle must result in a market based on price only. When price is the governing factor, service has little opportunity to make headway.

"If the electrical industry is to maintain its reputation for dependability and service it must do nothing to build a market solely on price.

"If the disturbing factors which have entered into the movement of electrical merchandise from producer to consumer are to be eliminated, this orderly principle of distribution must not only become our preachment but our practice.

"With this policy we maintain that a channel of distribution can be set up that is fair, equitable, sound and logical. As an evidence of good faith every member of our Association should recognize his individual responsibility in making the policy effective. If we are able to crystalize this attitude in the individual conduct of our members we believe that the manufacturer and the jobber will each feel that he has the corresponding obligation and will cooperate to the fullest extent in the realization of the ideal.

"Associations may pass resolutions but resolutions can only be realized through membership support."

Electrical Contractors of North Bay District Form League

An organization of the electrical contractor-dealers and others in the industry of the North Bay district was recently formed at a meeting held at the Napanee Grill, in Napa, Calif. The chief purpose of the organization will be to foster a higher standard in electrical installations and to promote the industry in all of its phases. Earl Wilson, electragist of Napa, was elected president of the organization; and R. McMullin, Pacific Gas and Electric Company, Napa, was selected secretary-treasurer. Directors of the new organization were named as follows: H. E. Brillhart, Napa; H. E. Decker, Calistoga; Edward E. Pierce, Vallejo Light & Power Company, Vallejo; B. L. Taylor, Taylor Electrical Company, St. Helena, and A. J. Martison, Radio Electrical Shop, Sonoma.

Three names were proposed for adoption as the name of the new organization, but were not acted upon. They were: "Tri-County Electrical League;" "North Bay Electrical Development League;" and the "Napa Valley Electrical Development League."

The Bank of Napa was selected as the

depository for league funds. This selection was made because the bank is completely equipped with electricity, using electricity for heating purposes, as well as being supplied with a large number of convenience outlets for operating electrically operated adding machines, comptometers and similar equipment.

Representatives were present from Napa, San Rafael, Vallejo, Sonoma, St. Helena and Calistoga. LeRoy H. Crandall of the California Electrical Bureau of San Francisco arranged the details for the meeting.

Executive Committee Meeting Produces Real Results

One of the most important meetings of the executive committee of the Association of Electragists, International, was held in New York City on March 16 and 17. A clean-cut policy of distribution, a definite direction to all-metal code activity, and recommendation of separate lighting and appliance circuits were among the outstanding results of this meeting.

After a thorough discussion in which the need for constructive leadership was pointed out the resolution on trade policy was passed unanimously, based on a report made a year ago by the trade policy committee which outlined generally existing conditions. The resolution follows:

That the trade policy committee and the president be instructed to carry out vigorously the policy of this Association; that is, that distribution shall be free from manufacturer through jobber through contractor and dealer to consumer. This it will be noticed is quite definite. The full force will be realized more fully after reading the statement of President Fowler which appears separately.

The committee believed that greater progress would be made if its activities on all-metal code were directed toward the most logical places rather than if they were to attempt too much and so meet a possible antagonism by trying to cover all wiring at the present time. For that reason the committee voted: That until further action the activities of the Association toward all-metal code be directed to the furthering of all-metal standards in congested districts and in certain classes of buildings to be further determined.

The mistreatment of branch circuits by overfusing was discussed and the committee requested: That the executive committee request our representative on the electrical committee to work for a code requirement that lighting outlets for both ceiling and brackets be on circuits independent of all other outlets. It was brought out that non-interchangeable fuses for lighting circuits would not be prohibitive financially.

Californians Are Appointed to National Committees.—California electragists are taking an active part in the affairs of the Association of Electragists, International, and two of them have been recently appointed to important committees by President Fowler. H. H. Walker, H. H. Walker Company, Los Angeles, has become a member of the business conduct committee, and Clyde L. Chamblin, California Electrical Construction Company, San Francisco, is chairman of the membership committee.

Pacific Coast Electrical Association

Final Technical Section Conclave Held at Fresno

Year's Affairs Are Rounded into Completion in Preparation for the National Convention in June

Technical Section activities of the P.C.E.A. for the year 1924-5 culminated in the meetings held at Fresno, Calif., March 25-27. These meetings were of especial importance because the coming convention of the National Electric Light Association to be held in San Francisco in June made necessary the completion of work in hand now instead of in June as is the usual custom.

The gathering totaled 112 men representing practically every technical phase of the electrical industry. Keen, active interest was displayed by all of the delegates, and the quantity and quality of constructive work accomplished and reported upon reflected at once the time and effort that have gone into the important projects taken up by the various committees. In many instances the committee work has been of such nature as to be of value not only to the West, but to the East as well. Two of the committee reports will go in as the report for the National Technical Section on the subjects involved.

The Cleveland meeting held in February was reported upon by all six of the Pacific Coast delegates for the particular branch in which each is interested. All were unanimous in proclaiming the obvious value of these intersectional meetings to individual, association and company alike.

The apparatus bureau has had a full program for the past year and has carried on studies in several fields. Interrupting capacities of oil circuit breakers and possible means for increasing the same, as well as means for determining the actual ratings of those of local manufacture, have been a live subject. This is also true of the subjects of the standardization of distribution transformers and appurtenant equipment and of relays and relay application. Proper grounding methods for stations and equipment, fire-fighting equipment and automatic substations all have come in for their share of thought and discussion. With a view toward assisting the continuity of the work of the bureau, several subjects were suggested for next year's program. These included Pacific Coast practices in distribution and transmission substations; a further study of grounds and grounding methods; further studies of oil circuit breakers and actual system tests upon them; observations and records covering the performance of breakers; studies into the question of the best voltages for distribution transformers; relay performance and application studies; high tension fuses, and possibly also a study of carrier-current telephony.

Routine telephone matters and a review of several outstanding typical cases have occupied the time of the inductive co-ordination bureau. Radio disturbance is a subject that is demanding much time and effort on the part of the bureau. It is brought out that many individual efforts are under way at the present time, and it is the desire and object of this bureau to study them all and bring about an exchange of information so that the best equipment and most economical methods may be adopted by all parties interested. For next year's work has been suggested a study into the economics of tracing radio disturbances; the tabulation of all data concerning cases of trouble; the classification of causes and noises; and the undertaking of authentic publicity giving reliable information concerning radio noise troubles to offset the many stories now being published for more or less political purposes by unqualified persons.

Matters pertaining to and arising from the state safety orders have been sufficient to keep the safety rules bureau busy. Much thought and effort has been given to the promulgation of a satisfactory code of rules. It is believed by this bureau that each power company should have a qualified representative in the State Association of Electrical Inspectors. In this way a greater cooperation could be brought about. For next year it is recommended that a further study of safety orders and their application, and of national code changes be made, and the safety switch investigation be continued.

Six subcommittees have been carrying on as many lines of work under the overhead systems bureau. Line construction costs have been under consideration, and it was recommended that this subject be carried over through next year. Recent tests on steel and wood poles have brought out many interesting data which the committee is rounding into shape for the national committee. The most important division of the work of this bureau has been the revision of the line construction rules contained in General Order 64 of the California Railroad Commission. This work has been done under the direction of J. E. Macdonald, who has put much time and effort into the project of bringing out a clear, concise code and one satisfactory to all parties concerned.

A plant layout study covering twelve Pacific Coast hydro plants has been the endeavor of the hydraulic power bureau this last year. This report is now com-

COMING PACIFIC COAST ELECTRICAL ASSOCIATION MEETINGS

Commercial Section—
Conclave and Executive Meeting—San Joaquin Light & Power Building, Fresno, Calif.
April 3-4, 1925

Pacific Coast Electrical Association—
Annual Meeting—San Francisco, Calif.
June 15, 1925

plete and will be the report of the national committee on that subject.

Underground cables are in experimental operation in Italy at a phase-to-phase voltage of 135,000, and 66,000-volt, single-phase cables have been in operation in the East for some time without interruption to service. A study of these and allied subjects has occupied the time of the underground systems bureau, which expects to continue the study next year. Specific subjects suggested include cable terminals; kenotron tests; suitable duct material and other questions.

Information of widely different classifications has been supplied by the meter bureau to the national committee, although no specific subject was assigned to the local bureau. High-tension metering for operating purposes; the proper size of meter for various services; the proper test periods for different classes of metering equipment and state safety orders are some of the subjects covered during the past year. Several subjects are recommended for the coming year's work. Among these are the metermen's course; relay maintenance; means of securing a sine wave current for relay testing, and the study of new devices and meters recently brought out.

Accident prevention work is of a slightly different nature than that of the other bureaus, but is nevertheless of equal importance for it is dealing with the human element of the industry. The work of this bureau is primarily that of education.

The prime movers bureau has worked up three subjects for the national committee during the last year. Next year's proposed schedule includes a study of oil burning; condenser leakage; cooling towers and ponds; heat balance, and station auxiliaries.

Progress for the Technical Section as a whole also must be recorded. As a means of increasing the efficiency of the section and the various bureaus it was decided to adopt the plan of appointing a vice-chairman for each bureau. Under this scheme the vice-chairman is to assume such duties at the direction of the chairman as will familiarize him with the details of the activities of the bureau throughout the year. The vice-chairman then will become the chairman for the succeeding year. He will be posted already upon matters and thus will be able to carry on the work of the bureau without interruption. In the past the delay and lost time due to yearly reorganization and the inertia in getting under way materially have reduced the efficiency of the organization.

Another development that may be of interest is the fact that the term "bureau" has been relegated to the past. It was believed by the executive committee that the term was unsuitable for the Technical Section. In the future the divisions of the Technical Section will be known as "committees."

The San Joaquin Light & Power Corporation, collectively and through several of its individuals, contributed unstintingly to the success of this series of meetings.

The San Joaquin Power Club staged a most successful social evening and dance following the general evening meeting of the technical delegates. Following the close of the session Friday afternoon, the visitors were treated to a demonstration of the hot-line handling tools developed by certain of the San Joaquin organization. With the use of the special, long-handled tools line wires were tied to insulators, dead-end insulators were replaced, and new-line taps were put on. The demonstration was complete and most interesting.

Under the direction of R. M. Peabody a party of the men spent Saturday and Sunday in a tour of the Big Creek plants and an inspection of the lower end of this project.

Announce Prizes for Employees' Home Lighting Contest

Entries in the Employees' Home Lighting Contests recently conducted by many of the central stations of the West were due in the hands of the judging committees of the companies on March 31. Primers that are to be entered in the contest conducted by the P.C.E.A. must be in the hands of V. W. Hartley, chairman, Home Lighting Contest Committee, 314 Rialto Building, San Francisco, by April 11. The paper that is judged the best by the P.C.E.A. judges will be sent to the N.E.L.A. to be entered in the national contest.

A $50 prize will be awarded by the lighting bureau of the Commercial Section of the P.C.E.A. The N.E.L.A. list of awards includes: a $500 first prize; a $300 second prize and a $200 third prize. Announcements of the winners in the national contest will be made at the N.E.L.A. convention to be held in San Francisco, June 15-19.

P.C.E.A. Commercial Section to Meet.—An executive and conclave meeting of the Commercial Section of the P.C.E.A. is to be held in Fresno, Calif., April 3-4. This will be the last meeting of the section prior to the annual convention of the association to be held in San Francisco June 15. Final reports of all bureaus will be presented at this meeting of the section. Meetings will be held in the San Joaquin Light & Power Building.

Book Reviews

THE STANDARD ELECTRICAL DICTIONARY

By T. O'CONNOR SLOANE, A.M.,E.M., Ph.D., author of "Arithmetic of Electricity," etc., with additions by Prof. A. E. Watson of Brown University. 790 pages, 497 illustrations. $5. Norman W. Henley Publishing Company, New York, N. Y.

Sloane's Standard Electrical Dictionary is in reality something more than just a dictionary. It is almost an encyclopedia. Words and phrases are dealt with in a manner which gives more than a mere definition as the description of various articles are comparatively lengthy and give details beyond the mere meaning of the word or phrase in question.

In this work the author has evidently endeavored to touch at least briefly all recognized branches of the electrical industry, and in a non-technical manner understandable to even the person not intimately connected with the industry. The book is of more value to the practical electrical man than it would be to the trained engineer or technician. To the student or one interested in the early developments of electricity this electrical dictionary would be a source of interesting information.

Three sections make up the book. The first section is practically a reprint of earlier editions evidently and gives detailed information concerning the earlier understanding and application of electricity. The second section covers quite completely the later developments in the electrical art, while the third section is a rather complete dictionary of radio terms.

Many words and phrases pertaining to electricity and which are not found in the usual publication are described or defined. Many illustrations serve to clarify the text and to give a better understanding of representative subjects.

INDUSTRIAL ELECTRICITY

By CHESTER L. DAWES. 371 pages, 267 figures. $2.25. Published by McGraw-Hill Book Company, New York, N. Y.

From time to time books covering the practical application of electricity appear, but this text is outstanding, both in the thoroughness with which the subject is treated and the simplicity of the descriptions involving apparatus.

This volume, which covers direct currents only, has been prepared to fit the needs of students in technical high schools and other schools not of collegiate grade. As the title of the book indicates, the industrial applications of electricity are stressed throughout. According to the author his intention has been "to give a bird's eye view of electrical engineering and its problems to the student who is beginning to study the subject, either by himself, or in courses of the grade of those given in the technical high schools."

The first few chapters of the text cover Magnets and Magnetism; Electromagnetism; Resistance; Ohm's Laws and the Electric Circuit; and Battery Electromotive Forces and Kerchhoff's Laws. Then follow practical applications of these principles in the form of chapters on Primary and Storage Batteries; and Electrical Instruments and Measurements. Principles are again treated in the chapters covering the Magnetic Circuit; Electrostatics and Capacitance. Generator and Generator Characteristics and Motors and their characteristics are treated in the next three chapters, followed by a final chapter on Losses, Efficiency and operation of direct current machinery. The last fifty pages contain several hundred questions and problems which should add considerably to the value of the book.

Direct current power distribution is not treated, as it is intended that this subject be treated with alternating current transmission in a later book covering the industrial applications of alternating currents.

The book is quite up-to-date in all respects as evidenced by material being included such as the Delco Starting Light System and it should fill admirably the purpose for which it is intended, and can no doubt be well used as a reference book by men engaged in the everyday operation of electrical machinery.

E. R. S.

Meetings

Oakland Electric Club Elects Officers for Ensuing Year

At a recent meeting of the Electric Club of Oakland, Calif., Ben C. Hill, superintendent of electrical inspectors of the city of Oakland, was elected president of the organization. Other officers elected at this time were: Vice-president, Walter Spencer, Spencer Electric Company; secretary-treasurer, Edgar C. Fisher, Joint Pole Association. The executive committee members are: Romaine Myers, consulting engineer; Ross M. Gilson, Ross M. Gilson Company; Edgar Powers, heating specialist. The Oakland Electric Club meets every Monday noon at the Hotel Oakland.

Four New Prizes Are Offered to N.E.L.A. Membership

Four new prizes have been added to the list open to the membership of the N.E.L.A. since the 1924 convention, and the awards in these contests will be made for the first time at the annual convention to be held in San Francisco, June 15-19. The new prizes total $1,500 in value and bear the names of their donors, Martin J. Insull, James H. McGraw, and Arthur Williams, with the exception of the H. M. Byllesby prize, which is donated by the H. M. Byllesby Company in memory of its late president.

The total list of prizes now open to members of the association is as follows:

The Doherty prize—gold medal.

The Harriet Billings prize—$50.

The H. M. Byllesby prize—$500, divided thus: $250 first prize; $150 second prize; $100 third prize.

The Martin J. Insul prize—$250.

The James H. McGraw prize—$500, divided thus: $250 first prize; $150 second prize; $100 third prize.

The Arthur Williams prize—$250.

Frank W. Smith educational prize—$100.

The Insull Medal—for life-saving by resuscitation.

A complete listing of the qualifications of contestants, together with contest rules appears in The N.E.L.A. Bulletin, February, 1925, pp. 121-2. All papers to be entered in the contest must be in the hands of the secretary of the association not later than April 15.

Plans of Pacific Coast A.S.M.E. Meeting Announced

Plans are well in hand for the Pacific Coast A.S.M.E. regional meeting, which is to be held in Portland June 22-25. The meeting follows closely upon the annual convention of the National Electric Light Association in San Francisco June 15-19, and an invitation to visit the Portland meeting will be tendered to those in attendance at the convention.

Papers to be read at the technical sessions include, "The Utilization of Wood Waste," "The New 30-Inch Suction Diesel Dredge," "The Mechanical Engineering Features of the Long-Bell Lumber Company's New Saw Mill at Longview, Wash.," "Electric Logging," "Steam Logging," "Cable Systems in Recent Logging Developments," and "The New Hydroelectric Plant of the Portland Electric Power Company."

Inspection trips will be made to the Oak Grove power plant, the hog fuel power plants in and around Portland, and the Longview Lumber Company's mill, while sightseeing tours to points of scenic attractiveness and other entertainments have been planned for the visitors.

A.I.E.E. Nominations Announced.—At a meeting of the board of directors of the American Institute of Electrical Engineers held in New York March 13, the following were nominated as candidates for office for the ensuing year: President—Dr. Michael I. Pupin, Columbia University, New York; vice-presidents: No. 2 (Middle Eastern District)—A. G. Pierce, Cleveland; No. 4 (Southern)—W. E. Mitchell, Birmingham; No. 6 (North Central)—H. S. Sands, Denver; No. 8 (Pacific)—P. M. Downing, San Francisco; No. 10 (Canada)—W. P. Dobson, Toronto; managers: M. M. Fowler, Chicago; E. C. Stone, Pittsburgh; H. A. Kidder, New York; treasurer: G. A. Hamilton, Elizabeth, N. J.

COMING EVENTS

Technical Section, Northwest Electric Light and Power Association—General Meeting—
Spokane, Wash.
April 16-17, 1925

Southwestern Public Service Association—
Annual Convention—Rice Hotel, Houston, Texas
May 5-8, 1925

Electrical Supply Jobbers' Association—
Annual Convention—Hot Springs, Va.
June 1-6, 1925

Associated Manufacturers of Electrical Supplies—
Annual Meeting—Hot Springs, Va.
June 8-13, 1925

Northwest Electric Light and Power Association—Annual Convention —
Gasco Building, Portland, Ore.
June 12, 1925

National Electric Light Association—
Annual Convention—San Francisco, Calif.
June 15-19, 1925

Northwest Technical Section to Meet in Spokane April 16

The second annual general meeting of the technical section of the Northwest Electric Light and Power Association will be held at Spokane April 16 and 17. During the two-day session, papers will be presented by some member of each subcommittee of the section, and general discussion on the various subjects presented will be invited.

H. H. Schoolfield, chief engineer, Pacific Power & Light Company, Portland, announces that this meeting is open to everyone desiring to attend and cordially extends an invitation to all interested.

Tentative Dates Set for New Mexico Convention.—The dates of April 20, 21 and 22 have been set tentatively for the holding of the New Mexico Electrical Association convention at Albuquerque that was postponed on account of important matters confronting the principal central stations at the time. Arthur Prager, general manager of the Albuquerque Gas & Electric Company, is in charge of arrangements for the convention.

Northwest Convention to Be Held in Portland June 12

At a meeting of the executive committee of the Northwest Electric Light and Power Association held at Portland March 9, 1925, it was decided to hold the 1925 convention of the association June 12, 1925, in the auditorium of the Gasco Building, Portland. At this time the reports of committees will be received, and an executive session will be held for the election of officers for the ensuing year.

Plans for a convention of the usual size and duration were abandoned on account of the convention of the National Electric Light Association in San Francisco, June 15, which will be attended by many members from the Northwest.

Date of Southwestern Convention Changed.—The Southwestern Public Service Association will hold its annual convention at Houston, Texas, May 5-8, 1925, instead of May 11-15. The date has been changed to avoid conflict with other conventions of interest to public utility men in the Southwest. Headquarters of the convention will be at the Rice Hotel, and reservations will be handled by the hotel management. The general convention committee is as follows: W. E. Wood, chairman, Houston Electric Company; S. R. Bertron, Jr., Houston Lighting & Power Company; F. D. Murphy, Houston Gas & Fuel Company; A. F. Townsend, Eastern Texas Electric Company, Beaumont; F. C. Armbruster, Southwestern Gas & Electric Company, Shreveport; B. F. Cherry, Weatherford Water, Light & Ice Company; G. W. Fry, president, West Texas Utilities Company, and E. N. Willis, secretary.

Electrical Bowling League Organized in Los Angeles.—A bowling league, consisting of teams from electrical jobbers in Los Angeles, has been organized in that city and on March 19 had completed one-half of the series that is to be played. Nine teams representing nine jobbing organizations and one made up of manufacturers' representatives are enrolled in the league. Tournaments are held on Thursday evenings at Jensen's Recreation Centre bowling alleys. The league was organized in December of last year. It is the intent of the organizers to include all branches of the industry in the league which will be formed next year. J. A. Sines, representative of the Chicago Fuse Manufacturing Company in Los Angeles, is organizer and secretary-treasurer of the league.

P.C.E.A. Papers Must Be in Secretary's Hands by April 1.—Papers prepared by the members of the Accounting, Commercial, Public Relations, Publicity, Purchasing and Stores, and Technical Sections of the P.C.E.A. must be in the hands of S. H. Taylor, secretary of the association, by April 1 to permit their publication in the June 1 issue of the Journal of Electricity. The Executive Committee of the association has requested every section chairman to endeavor to comply with this ruling. The papers will be given to the papers committee for editing before they are published. Papers should be sent to 527 Rialto Building, San Francisco.

Personals

O. B. Stubbs, president of the Stubbs Electric Company, Portland, a pioneer house in the electrical industry in the Northwest, was elected chairman of the Pacific Coast division of the Electrical Supply Jobbers' Association at the recent convention of that association at

O. B. STUBBS

Del Monte, Calif. Mr. Stubbs was born in Lawrence, Mass., and received his education at Concord, N. H., graduating in civil engineering. He came West in 1883 and became associated with the chief engineer of the old Oregon Steam Navigation Company, which was the forerunner of the Oregon-Washington Railroad & Navigation Company, the western link of the Union Pacific system. The original company operated boats between Astoria, Ore., and Celilo Falls on the Columbia River with a short rail portage by-passing the cascades at the site of the present Cascade Locks. Mr. Stubbs later worked for a time on the Cascade Locks project. In 1896 he started an electrical contracting business in Portland. His first large job was the installation of the electrical equipment on a government ship used for transporting horses to Manila during the Spanish-American War. He later took on the retailing of electrical appliances, and finally in 1910 entered the jobbing field, in which he has established his company as one of the leading electrical jobbers of the Northwest.

R. D. Thomas, associated with the Federal Electric Company of Denver, was a recent visitor in San Francisco in the interests of his firm.

Frank Dana, assistant general manager of the Electric Flow Meter Company, of Kansas City, is in San Diego supervising the installation and tests of some of his company's products at the San Diego Consolidated Gas & Electric Company's gas plant.

Carl Burgess, advertising manager of the Los Angeles district for the Westinghouse Electric & Manufacturing Company, paid San Diego a short visit recently, renewing acquaintances made at the convention last summer at Coronado.

C. D. Monteith, formerly in charge of the electric transportation bureau of the Pacific Gas and Electric Company, San Francisco, has been appointed lighting sales engineer for that company.

John C. Hoyt, chief of the surface water division of the water resources branch of the United States Geological Survey, Washington, D. C., was a recent visitor in Salt Lake City for the purpose of conferring with **A. B. Purton**, district engineer of the water resources branch of the Geological Survey. Mr. Hoyt was a delegate to the world power conference at London a short time ago.

C. F. Norton, sales manager of the Howell Electric Motors Company, Howell, Mich., represented in San Francisco, Los Angeles and Seattle by the Garland-Affolter Engineering Company, was recently on the Pacific Coast making a survey of the local motor situation.

C. Reeves has been appointed assistant for **G. O. Hodgson**, sales manager of the Edison Lamp Works at Denver.

Frank Perry, of the Wong & Perry Electric Company, Boston, was a recent visitor on the Pacific Coast.

R. C. Newhouse, of the Allis-Chalmers Manufacturing Company, Milwaukee, recently spent some time in San Francisco.

Dr. Michael I. Pupin, of Columbia University, New York, has been nominated for president of the American Institute of Electrical Engineers. **P. M. Downing**, vice-president in charge of electrical construction and operation, Pacific Gas and Electric Company, San Francisco, was nominated for vice-president for the Pacific district.

John J. Gibson, vice-president, Westinghouse Commercial Investment Company, New York, was recently in San Francisco in the interests of his company.

Floyd Averill, president Fobes Supply Company, Portland, was a recent visitor in San Francisco.

W. H. Kaemper of Listenwalter & Gough and **W. J. Ettiene**, associated with the Zenith Radio Corporation, both of San Francisco, left recently for Chicago in the interests of their respective firms.

B. J. Wildman, Pacific Coast manager of Moe-Bridges Company, San Francisco, recently departed on a tour of the Northwest in the interests of his company.

G. R. Henninger, associate editor of the Journal of Electricity, paid San Diego a visit March 16 and 17, taking in the St. Patrick's party of the San Diego Electric Club while there.

Felix Van Cleef, of Van Cleef Brothers, Chicago, recently spent some time in San Francisco while on a tour of the Pacific Coast.

J. P. Fairbank, extension specialist in agricultural engineering, University of California, recently presented a kitchen lighting demonstration at the Arcade School in Sacramento.

W. A. Brackenridge, vice-president, Southern California Edison Company, Los Angeles, was a recent visitor in San Francisco.

Arch Miller of the Miller-Seldon Electrical Company, Detroit, recently visited San Francisco.

M. W. Kellogg, head of the M. W. Kellogg Company of New York City, spent some time in San Francisco recently in the interests of his concern.

H. W. Crozier, hydroelectric engineer of the San Francisco office of Sanderson & Porter, recently was in Aberdeen, Wash., on business connected with the Grays Harbor Railway & Light Company. While there he addressed the Aberdeen Rotary Club on the subject of power possibilities in the Grays Harbor country.

Harris J. Ryan, professor of electrical engineering at Stanford University, Palo Alto, Calif., has been made a doctor of laws of the University of California, Berkeley, in recognition of his services in the furtherance of electrical development in general, and of his contributions to existing data on high-voltage transmission and phenomena in particular. The decree was conferred March 23 at the annual charter day celebration at the University of California. Professor Ryan graduated from Cornell University with a degree of electrical engineering, and since then has devoted himself to the advancement of that science. At Stanford University he has spent the greater part of his time in research work in connection with high-voltage transmission. He has developed a high-voltage wattmeter for measuring corona and other power losses on high-voltage circuits, and this instrument has been perfected to such an extent that the power of a single brush discharge and power losses as small as a quarter of a watt may be measured on a 220-kv. line. He is considered one of the foremost authorities on the subject of corona, and his cathode ray oscillograph studies, which he has been pursuing since 1900, have added much to the knowledge of the dielectric properties of air and the phenomena of corona. As soon as the new 2,000,000-volt laboratory to be erected at Stanford (Journal of Electricity, March 15, p. 222) is completed,

HARRIS J. RYAN

Professor Ryan will be in charge of all experimental work there and will devote his entire time to research in connection with the new equipment. Aside from his work at the university, he has been active in an advisory and consulting capacity. He has been consulting engineer of the Los Angeles Aqueduct; a director of the Supersonics War Laboratory, National Research Council; and U. S. Government delegate to the International Electric Congress. He is a past president of the American Institute of Electrical Engineers and a member of many other leading and scientific societies.

H. E. Sandoval, for twelve years associated with the Pacific Gas and Electric Company, San Francisco, resigned April 1, 1925, to become president and general manager of the Sandoval Sales Company, a newly organized $100,000 corporation. The business of the firm will be that of manufacturers' agents, and already it has been appointed executive distributor of Wesix electric products for northern California. Offices and display room will be maintained at 115 Jessie Street, San Francisco. Mr. Sandoval received the degree of bachelor of science in electrical engineering from the University of California in 1912. He became associated with the Mount Whitney Light & Power Company, Fresno, Calif., and remained with them until 1913 when he was employed by the Pacific Gas and Electric Company. He is familiar with all phases of the central-station branch of the industry; for the past several years he has been manager of electric sales. Mr. Sandoval is well known to members of the electrical industry and has been active in its development and betterment.

H. E. SANDOVAL

E. C. Headrick, director of the Association of Electragists, International for the Rocky Mountain district, departed recently for New York where he will attend the national executive committee meeting. On his return he plans to stop over at several Eastern cities.

John Farley succeeds **C. D. Monteith** who recently resigned as secretary-treasurer of the Electric Transportation Association, San Francisco.

W. F. Brainerd, formerly field representative of the California Electrical Bureau in southern California, has been appointed assistant secretary of the bureau with direction over the Los Angeles activities and the field staff in the south.

A. W. Leonard, president, **H. J. Gille,** general sales manager and **F. W. Brownell,** comptroller, Puget Sound Power & Light Company, Seattle, recently spent some time in San Francisco in the interests of their concern.

L. W. Sherman succeeds **R. N. Phelan** as the new secretary-treasurer of the Electrical Contractors and Dealers' Association of Sacramento, Calif. Mr. Sherman was formerly with the Latourrette-Fical Company of that city and more recently employed as superintendent of mechanical and electrical construction at the Veterans' Hospital, Livermore, Calif.

P. F. Apfel, president of the Electric Heating & Manufacturing Company, Seattle, recently visited California and spent considerable time with his representatives, the Wholesale Electric Company in San Francisco.

H. A. Norris, architect of Sydney, Australia, who has come to the United States to study American building construction methods, is the guest of the Westinghouse Electric & Manufacturing Company, San Francisco. He will be entertained also by some of the company's Eastern offices during his tour.

W. P. Stranborg, publicity manager, Portland Electric Power Company, and chairman Utility Advertising Section, Associated Advertising Clubs of the World, was a recent visitor in San Francisco.

S. L. Albaugh, Los Angeles representative of the Johns-Pratt Company, was a visitor to San Diego early in March. He was a guest of the Electric Club while there.

Kenneth E. Clarke has been appointed vice-president and general manager of the United Electric Company, Canton, Ohio. He was formerly general manager of Altorfer Brothers, Peoria, Ill.

A. C. McMicken, sales manager of the Portland Electric Power Company, Portland, left for New York City recently to attend a meeting of the Commercial National Section of the N.E.L.A.

Carl F. Uhden, formerly chief engineer of the Gorge Creek development of the Skagit project, Seattle, has opened an office at 1409 Alaska Building, Seattle, as a consulting and contracting engineer.

Sam Gates, general manager of the Los Angeles division of General Electric Company, together with Mrs. Gates and L. Spring, merchandising specialist of the company, were the outstanding out-of-town guests of the Electric Club's St. Patrick's party, March 17.

A. F. Blecksmith, district sales agent in Los Angeles for the Duncan Electric Manufacturing Company of LaFayette, Ind., was recently a visitor in San Francisco.

Walter Schmidt, electrical engineer, Los Angeles, recently spent some time in San Francisco.

N. B. Osborn, representing Landers, Frary & Clark in Washington and Oregon, was in San Francisco recently, having been called there by the death of his mother who passed away in that city.

H. G. Kelsey succeeds **Frank Thomas** as sales manager for the Grays Harbor Railway & Light Company, Aberdeen, Wash. Mr. Thomas has gone into business as a partner under the firm name of Phillips & Thomas, dealers in electrical supplies.

E. L. Crider, Puget Sound Power & Light Company, Seattle, was a recent visitor in San Francisco.

T. A. Wood, formerly connected with the Cerro de Pasco Copper Corporation at Oroya, Peru, is now field engineer for the Committee on the Relation of Electricity and Agriculture under Prof. B. D. Moses, with headquarters at Davis, Calif.

L. D. McFarland, president of L. D. McFarland Company, Ltd., Sandpoint, Idaho, extensive producers of cedar poles, accompanied by his family, recently stopped over at San Francisco for a few days while en route to the Hawaiian Islands.

Norman B. Hickox, for several years past assistant general sales manager, Curtis Lighting, Inc., Chicago, has been made vice-president of that company in charge of sales.

W. H. Huttinger, chief engineer, Electric Power Equipment Corporation of Philadelphia, is touring the Pacific Coast states in the interests of his company.

W. H. McGrath, vice-president Puget Sound Power & Light Company, Seattle, recently left for a month's visit in California.

Capt. G. B. Baldwin, publicity department, Pacific Gas and Electric Company, San Francisco, spoke on "Hydroelectric Development in Northern California" at a recent meeting of the Business and Professional Women's Club of that city. Music was furnished by the P. G. and E. Trio.

Obituary

Vernon Wilder, superintendent of the Bishop district of The Southern Sierras Power Company, Riverside, Calif., died suddenly in the latter city recently while there on business. He was also at the time of his death general superintendent of the Interstate Telephone & Telegraph Company, a subsidiary of The Southern Sierras company, and was widely known throughout Owens River Valley. After graduation from college Mr. Wilder entered the telephone business, and from 1898 to 1912 was connected chiefly with the Bell Telephone Company as exchange manager, traffic manager and division traffic superintendent, with two years as chief electrician of the Hanolton Light & Water Company. In 1914 he became traffic chief of the Interstate company, with headquarters at Bishop, being appointed local superintendent the same year. In 1920 he was promoted to the two positions he held at the time of his death. He was also president of the Bishop Chamber of Commerce and chairman of the Bishop Board of Elementary Schools. Mr. Wilder was an efficient official and a valued leader in civic affairs, and his passing is a loss to the community.

VERNON WILDER

TRADE NOTES

The Tacoma Electric Company, Tacoma, was recently damaged to the extent of $6,000 by a fire which swept an adjoining building. The company's stock was not burned, but was damaged by streams of water flowing from the room above and adjoining.

The Chicago Fuse Manufacturing Company, Chicago, recently has issued a 96-page catalog, which they will be glad to send to anyone interested. The book is very complete, giving sizes, prices and information of every kind that might be desired by buyers of fuses and allied products.

M. H. Detrick Company, Chicago, recently has issued a new catalog, profusely illustrated with photographs and drawings, containing much detailed information on Detrick arches.

The Okonite-Callender Cable Company, Inc., recently has purchased a plant in Paterson, N. J., where it will manufacture lead-covered paper insulated cables.

Charles Cory & Sons., Inc., New York City, are distributing on request the new Cory Interlocks Bulletin No. 105-29-B, describing many types and methods of installation of this device to prevent accidental opening of disconnecting swiches while under load, by station personnel, and to prevent damage from the same cause through malicious tampering. They have also issued a bulletin on central station load indicators, that contains an interesting description of the complete systems and many illustrations of the various types of load and period indicators, manual controls and totalizing watt-meter operated automatic control.

Viele, Blackwell & Buck, New York City, has recently issued its new Bulletin No. 12 on weldless steel poles.

Hurley Machine Company, Chicago, has recently put on the market a small home ironing machine. The roll is 30 in. long and the heating element in the shoe is 1,000 watts. It is automatic and is said to have exclusive features designed to make operation safe and easy, as well as being constructed to require only a small amount of space when not in use.

The Esterline-Angus Company of Indianapolis has issued a new folder, containing information on graphic instruments that will be sent free upon request of interested parties.

The Elwell-Parker Electric Company, Cleveland, has recently developed an electric elevator tructor for transporting and stacking bulky cylindrical and rectangular loads. The tructor handles rolls of fabrics, carpet, linoleum, rubber stock, steel, newsprint and barrels, bales, boxes, textile beams. One man operates the equipment and has clear vision of the forward part of the unit at all times.

Hendrie & Bolthoff Company and the **B. K. Sweeney Electrical Company**, Denver, are taking an active part in the reorganization of the radio trade groups in that city. Both are members of the newly created Radio Jobbers Association, of which George Hopkins of Knight-Campbell Company is president.

Superior Refrigeration, Inc., Lima and Wapakoneta, Ohio, has issued recently a booklet entitled, "Superior Refrigeration," that describes the advantages of electric refrigeration in the home.

The Advance Machinery & Supply Company, Denver, western representatives of the **De Laval Steam Turbine Company** of Trenton, N. J., has recently received an order from the Board of Water Commissioners of the City and County of Denver for one 15,000,000-gal. centrifugal pump, driven through reduction gears by a De Laval steam turbine together with condenser and auxiliaries complete. This makes four De Laval units installed in the Denver water works system in the past two years.

The Bonnot Company, Canton, Ohio, has ready for distribution its Bulletin No. 64 on its Unit-Air ball mill. It describes the principles of construction of the mill and its advantages, and is well illustrated with cuts of the machine.

Capital Electric Company, Denver, lamp refill manufacturer and distributor at 1122 California Street, is constructing an addition to its plant, the cost being estimated at over $20,000.

The Sangamo Electric Company, Springfield, Ill., has announced a new line of amperehour meters, known as Type N, which is a simple form of mercury-motor meter comprising a single copper disk rotating in a mercury chamber located between the pole tips of two large permanent magnets. The meter is furnished in various types.

Butte Electric & Manufacturing Company, San Francisco, has issued recently a descriptive catalog of switchboards and other special electrical apparatus. The manufacture of a new line of "Shockpruf" switches for light and power service is announced also.

The Ideal Electric & Manufacturing Company, Mansfield, Ohio, manufacturers of power apparatus, has announced the reopening of its San Francisco office at 611 Howard Street. A. J. Myers will be in charge.

Hurley Machine Company, Chicago, has announced the organization of the **Hurley Vacuum Cleaner Company**. The new company will take over all of the parent company's vacuum-cleaner business and will have its main office on the eighteenth floor of the Steger Building, Chicago. E. N. Hurley, Jr., has been elected president of the new company.

The F. W. Wakefield Brass Company, Vermilion, Ohio, has recently adopted a new finish, known as "egg shell bronze," for a special line of lighting fixtures. The finish is regular bronze plated upon a solid brass base, but the Wakefield product being die-formed, the result is an eggshell effect instead of being polished as is the case where a bronze finish is applied to spun metal.

Square D Company, Detroit, has announced the completion of a new switch designed and built for use as an entrance switch, disconnect, or for installations demanding infrequent operation. This new type switch, which is quick break, has single throw action, is fusible and is being built in the 60,100 and 200-amp., 3-pole, 250-volt sizes. It is known as the 46,000 line.

Wagner Electric Corporation, St. Louis, has issued an attractive bulletin, No. 143, which gives a complete detailed description of its new and varied line of electric fans, electric current data, and is profusely illustrated.

The picture of this young happy couple was taken on board the Matsonia sailing for Hawaii. If we did not know them better we might suppose this to be a honeymoon trip. C. E. Heise, San Francisco district manager, Westinghouse Electric & Manufacturing Company, and Mrs. Heise are spending a month in the Hawaiian Islands where Mr. Heise will confer with the Westinghouse company agents, The Hawaiian Electric Company, Ltd., of Honolulu.

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San Francisco, Calif.

N. E. L. A. Convention
San Francisco—June 15-19

April 15, 1925
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Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES

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P.C.E.A. Committee Reports to Appear June 1

BECAUSE there will be no opportunity for discussion of the many important Pacific Coast Electrical Association committee reports this year at the National Electric Light Association convention in San Francisco, the June 1 issue of the Journal of Electricity will be of more than passing importance. As has been the custom in the past, this issue will carry all of the convention papers. This year members will be requested to submit written discussion.

The reports prepared by the bureaus and committees for the year 1924-25 have been characterized as the finest ever submitted. Papers will be published that will be of great interest to every branch of the electrical industry. Many of the reports have been prepared at the request of sections of the National Electric Light Association. In this particular, we might mention the report on metered water heating, prepared by the Commercial Section, and the study of hydroelectric plant layout by the hydraulic power committee for the Technical National Section.

For the electrical contractor we might mention the report on electric air heating, that contains sufficient data for the calculation of any type of air-heater installation. Dealers will be interested in the reports prepared by the appliance committee of the Commercial Section.

From every standpoint, a careful study of the June issue will be well worth while to anyone engaged in the industry. The issue will constitute a text and reference book for the industry for the next year.

EDITORIAL

In Memory of JAMES A. LIGHTHIPE

OF the beautiful lives of the men of the generation of which I have been a part, that of James A. Lighthipe which passed out on April 10 stands forth preeminent in its simplicity, devotion to his fellow men and loyal pride in the great profession of which he was a pioneer. For twenty-eight years my association with Mr. Lighthipe, both in business and in private life, was of the closest. During that long period which witnessed the great evolution in the electrical industry, bringing with it all the problems and perplexities which naturally follow in the changing of a world from one form of light, heat, power and mechanics to another, I cannot recall one single instance when Mr. Lighthipe lost that poise which was the dominating feature of his character. The calm, scientific mind which seemed to dwell above the conflicts of the hour was a source of strength upon which all of us who enjoyed the blessing of his friendship and companionship could rely. Absolutely incapable of an unselfish thought and always giving of the wealth of his genius, technical knowledge, and vast experience to those who were endeavoring to follow the path of the great pioneer of the electric industry, he gave to his profession the priceless gifts of science, knowledge and unquenchable enthusiasm. Of what his life work has meant to the thousands whom he has edified, inspired and encouraged, and to the millions of people who today are enjoying the facilities of light and communication which his modest, unassuming life work helped make possible for humanity, is beyond the comprehension of those who have known him best as a companion, a confidant and a loyal friend.

In all the years that I have known him—years fraught with the adventures of great achievements; grinding and bitter disappointments; of the slow and patient march to the goal to which he strove, I cannot recall his ever speaking an impatient or peevish word. He seemed always seeking and striving by word and counsel to help his fellow men and to steady their little craft among the storms of life.

The friend and co-worker with Thomas A. Edison in the years that he was developing the electric light and loud-speaking telephone, the emissary of the great inventor in installing the achievement of his inventions in foreign lands, and the companion and co-worker with Steinmetz and many others of the masters who have made the history of our generation, we cannot but ponder to what extent his genius and his steady and patient life work entered into their achievements. His contribution to their successes must have been enormous.

In our own organization, the Southern California Edison Company, in which the last twenty years of his remarkable life have been literally interwoven with its warp and woof, he was a factor which I believe was dominating in welding it into a very high degree of scientific perfection. Not only over the vast system where his handiwork is visible in almost every physical achievement, but in the hearts and lives of the men and women of the organization, he still lives. Time alone can soften the pangs of sorrow which we feel today, and it will be very slow and very hard for us to realize that "the places that have known him shall know him no more forever."

R. H. BALLARD.

Lighting Offers a Broad Field for Increasing Revenue

RECENTLY an executive of a large utility company in the Pacific Northwest stated that in his opinion the power companies generally did not devote sufficient sales attention to prospective lighting business. It was his idea that the companies should have a lighting sales department comparable in size and importance to the appliance sales or power departments, which is not often the case at present. While this is an individual business problem with each central station company, in general the statement of this executive is true and merits careful consideration.

The lighting business has been taken as a matter of course, and the development of it has been left largely to other agencies such as wiring contractors, the lamp manufacturers and the sign manufacturers. Yet more than half the gross revenue of the electric service companies comes from this class of load. What, then, might be possible with a little more intensive cultivation of this business? Most utilities are alert regarding the development of new business, but what about capitalizing upon the old? The numerous antiquated lighting systems in the stores, offices, factories and homes of every town that could be replaced with modern, scientific systems to the mutual benefit of the customer and the company form a potential field for business that merits study. What agency is better equipped to develop this field than the utility company?

Appliance sales departments came into being

largely through a desire to fill in the valleys in the load curve, and the fact that lighting load is likely to be peak-load business might be advanced as an argument against putting the lighting sales department on a parity with the appliance department. However, is it not true that, due to the increasing diversity in the use of artificial light, a great deal of modern lighting is off-peak business? Conversely, is it not true, that any appreciable amount of appliance load also increases the peak? As a matter of fact, any intensive sales activity, if successful, will produce business which increases the peak, and it is the duty of the rate engineer to devise a rate structure that will make any class of business profitable. Further, it is a fact that much of the increase in lighting load could be taken on without a commensurate increase in investment in distribution lines, which is not always true in the case of substantial additions to the so-called day load.

The kitchen lighting campaign, an innovation of recent years, indicates a trend in the direction of intensive selling of more and better lighting directly by the utility company. We predict other similar campaigns will be devised concentrating sales effort on some other room of the house, or on some other class of lighting, and we predict that eventually a department devoted to the sale of lighting will be maintained as one of the most important departments in every progressive electric service company.

An English Version of an American Hydro Project

A critic opined that we were unduly harsh in disagreeing, in a recent issue, with T. B. Ross' comments in the "Electrical Review" on American life and customs at the Big Creek project of the Southern California Edison Company; but when we read the concluding installment we were convinced that we had exhibited mildness in administering reproof.

The final dose of undiluted "bunk" fills us with indignation and mirth. Mr. Ross witnessed some boxing contests among the men at the camp, which he characterized as "plain, undisguised slaughter." Each contestant apparently diregarded the feelings of his opponent, much to our visitor's disgust. Social distinctions were probably ignored. "It was a somewhat displeasing feature," remarks our mentor, with puritanical concern, "to see the keenness displayed by the womenfolk and children on such occasions." And this from a country where fox hunting, by both sexes, is the vogue!

To the temptation to criticize, Mr. Ross gives full rein. He petulantly complains of the "insularity" of the "ordinary untravelled citizen" of the United States, forgetful of the fact that this country is self-contained and self-sufficing, not a little manufacturing island. He finds that some of us are prejudiced against the foreigners, "particularly the English." After the exhibition he made of himself, is it any wonder? Frankly speaking, we are amazed at our forbearance. San Francisco recently bid Godspeed to a party of young men from Oxford University, England, who had spent several weeks touring the country in an effort to encourage a contempt for an amendment to the Constitution of the United States; yet nothing unkind or critical was said of them or to them so far as we can find out. But what would happen if a party of Yale undergraduates were to tour England as speakers in debates on the question "That this king business is the bunk"? Our transatlantic cousins all would contract apoplexy. Under similar conditions here, however, and despite the severity of reproof, we usually can find something that occasions a hearty laugh; moreover, we don't need to wait until old age before we can see the joke. Listen, gentle reader, to an experience of Mr. Ross at Big Creek, the recounting of which, in all seriousness, takes up much of the space occupied by his last tribute.

The Edison company apparently fumigates the bungalows periodically with sulphur. "It so happened that one of the mornings whilst I was asleep in my cabin, orders had been given to fumigate." Mr. Ross believed that the fumigator did not see him in bed, lit the candles in the ordinary course of duty and retired, closing the door behind him. "English," as he was known in the camp, writes that he had "no idea how long the candles were burning, but by the time I awoke the room was full of sulphur fumes, and I was having a hard struggle to breathe." Hasty escape into the outer air followed "at the very moment when many of the men's wives were wending their way past our bungalow enroute to the company store * * * One can imagine the shock they must have received * * * By evening I was probably one of the best known foreigners in Big Creek, and my English sleeping attire was the talk of all the ladies of the camp."

Our interpretation of the incident would take a different aspect, and we would suggest that the fumigator lacked thoroughness and planning in carrying out the program. Knowing the nationality of the victim, he should have arranged the blending of a little laughing gas with the sulphur fumes!

Priest Rapids Will Be Watched with Interest

MANY eyes will be on the Priest Rapids development on the Columbia River in Washington, when it is actually started. So far as we know no project like it has ever been attempted. Involving as it does the ultimate expenditure of $100,000,000 in round numbers, the development of 750,000 hp. of hydroelectric energy and the building of an industrial city to utilize in large blocks the bulk of that power almost at the power site will certainly furnish food for thought and mental speculation to engineers, economists, investors, and politicians of high and low degree, to say nothing of the average citizen, who is always interested in big things.

It is interesting to contrast this project with the Umatilla Rapids project on the Columbia, advocated as a government enterprise by certain interests in the Northwest last winter. If the Priest Rapids project is carried through to completion, and if it is successful (and we have no reason to doubt

the outcome) it will be because the market for the power has been provided. Such market was lacking in the case of the Umatilla Rapids project, and the prophecies of various newspapers advocating the scheme, as to irrigation developments, railroad electrification, influx of industries, house-heating and what not, proved to be wild imaginings that would not stand the test of sober judgment.

The advocates of federal development of Umatilla Rapids leaned rather heavily on the argument that the government alone is capable of undertaking projects of such magnitude, and now this argument has been knocked into the proverbial cocked hat. Rather is the truth found in the converse, that private initiative, through hope of reward, is the only agency by which such enterprises should be attempted. The risks are too great to be entrusted to an agency of bureaus and departments subject to the whims of politics. The main reason that our nation leads the world in industrial development is that private initiative more or less consistently has received rewards, and our government generally has kept out of business and has confined its activities largely to governing and regulating.

The problem is one in political economy, not in civics, and if Mr. Pierce and his associates are successful in solving the problem to their own pecuniary advantage, then the complete development of other Columbia River projects and similar projects elsewhere will follow more rapidly.

The Power Company and the Radio Problem

EDITORIALS in the radio press of recent date are loud in their criticisms of the electric service companies regarding disturbances which disrupt and interfere with radio reception. The claim is made that a large proportion of the so-called noises which make reception anything but a pleasure on certain occasions may be laid directly at the door of the power companies.

Many of these claims are unfounded. In localities where such disturbances are traceable directly to the power company, every step humanly possible is being made to correct them. Companies have assigned men in the service department whose sole responsibility is to follow up complaints of this character and correct them. Equipment is being studied and perfected for the purpose of tracing disturbances to their source. Much of the time and attention of the Inductive Cooperative Committee of the National Electric Light Association is being devoted to this subject, and within a short time reports will be forthcoming which will give a resume of methods and apparatus found suitable for locating these disturbances.

However, the electrical industry and especially the executives of the central station companies must realize that some of the claims made against them are well founded. Official recognition of the problem should come from the men at the top, and a public stand should be taken with emphasis laid on the steps which are being taken to improve present conditions.

If the reader happens to be a radio fan, rabid or otherwise, he will know that much of the interference ascribed to the power companies is attributable to some other cause. An X-ray machine, an elevator motor, static, regenerative howls and squeals and other extraneous noises are some of the chief offenders.

The problem is not one for a single agency to overcome. Rather than attempt to lay the major blame on the power companies, let the radio industry and the radio press do its part in solving the problem of overcoming these disturbances. Let the radio fan exercise due precaution in the operation of his equipment. In the meantime the utilities will do their share.

DISCUSSION

Engineer Suggests Naming Some Phase of Big Creek Project for John S. Eastwood

To the Editor:

Sir—In your March 1 issue you describe the Florence Lake tunnel of the Edison system, as conceived and carried out by G. C. Ward.

Twenty-two years ago this summer, the writer was transitman for J. S. Eastwood, on the preliminary survey of the Big Creek system. The plan as outlined by Mr. Eastwood at that time provided for three power drops on Big Creek, the reservoir now constructed and called Huntington Lake, the Vermilion Valley reservoir and feeder canal to the Jackass Flat reservoir, called now for euphony Florence Lake, and a feeder canal or tunnel from Florence Lake to Huntington Lake.

Since the original conception by Mr. Eastwood there have been additions to his plan, but the skeleton of it has been followed exactly as originally planned.

I find Huntington Lake, and Kerckhoff Dome, as prominent features of the landscape in that vicinity, but I find nothing commemorating the man who first investigated and called attention to the power possibilities of the Big Creek project.

Now that Eastwood has passed into the great beyond, it is fitting that the Edison company should honor him by dedicating some natural object or artificial structure to him, so that the world will know that he passed that way, and dreamed a dream that Mr. Ward and Mr. Redinger and others are making real in a very substantial way.

GEO. R. SHUEY,
Department of Public Service,
City of Los Angeles.
Independence, Calif., March 16, 1925.

ELECTRICITY continues to play an increasingly important role in the lumbering industry of the Pacific Coast, not only in the sawmills but in the woods as well. The accompanying two views show an electric yarder on the properties of the Snoqualmie Falls Lumber Company in Washington. Motors of capacities ranging from 300 hp. upward are used in this class of service.

Fig. 1.—Airplane view of the new shops of the Southern California Edison Company at Alhambra.

New Million-Dollar Shops of the Southern California Edison Company

By H. W. Tice

Construction Department, Southern California Edison Company, Los Angeles

ADEQUATE facilities for handling, storing, testing and repairing the large amount of equipment and material required annually by the Southern California Edison Company are provided in the new warehouses and shops recently completed at Alhambra, Calif. Constructed at a cost of approximately $1,000,000, this central storage and distributing headquarters is equipped with the most modern machinery for handling and testing material and supplies. In this article the author describes some of the most noteworthy features.

EARLY in 1923 the Southern California Edison Company was faced with the problem of providing adequate facilities for handling, testing and repairing the large amount of material and equipment that is required yearly for its extensive program of development. To meet the immediate requirements it was necessary to provide at least twice the floor area and open storage space that was being occupied by the stores, test and shop departments in their former location. In addition to providing for immediate requirements, there was the problem of providing sufficient acreage for future extensions.

The new warehouses and shops are located along the main line of the Southern Pacific railroad at Alhambra, Calif., on a plot of ground comprising an area of 27.2 acres, which is improved with a group of ten buildings having a total floor area of 330,000 sq. ft. or 7½ acres, and a pole-treating plant occupying 7.8 acres. Fig. 1 is an aerial view of the new stores, test and shop departments, and shows the respective location of the group of ten new buildings, spur tracks, roadways and pole-treating plant.

The three major departments consisting of the stores, test and shop departments are located in the four adjacent buildings facing a 50-ft. driveway. In the center of the plant is located a 100,000-gal. steel water tower, a 200,000-gal. concrete water reservoir and reinforced concrete pump house. The building next to the water reser-

voir is a reinforced concrete oil and paint house with eight steel storage tanks having a total storage capacity of 365,000 gal. for switch oil and transformer oil.

The other permanent improvements consist of a covered storage platform, a salvage stores department, and a small reclamation shop which is used in connection with the scrap department, and a hospital and employment building opposite the main stores building facing the 50-ft. driveway. The three temporary buildings located in the open space in the center of the plant are being used at the present time as temporary headquarters for the transportation department of this plant.

Main Unit of Stores Department

The main unit of the stores department is a steel and concrete structure, 200 ft. wide and 480 ft. long, with additional open platform storage space 200 ft. wide and 175 ft. long, giving a total over-all length of 655 ft.

The test department and transformer storage platform is 120 ft. wide and 580 ft. long. As shown in Fig. 2, the floors of these buildings are elevated 4 ft. above adjacent spur tracks and roadways in order to facilitate the loading and unloading of car and truck shipments.

The approach to these platforms from the roadway is made by means of 40-ft. ramps on a 10 per cent grade. Fig. 2 shows the spur tracks and loading platforms for these two units, and a second spur track entering the transformer storage platform a distance of 50 ft. directly in line with the crane runway structure over which are operated the 5- and 40-ton cranes.

The building to the left of the test department is the shop department, which is 120 ft. wide and 260 ft. long with 5- and 15-ton overhead traveling cranes. In this building are located the electrical and mechanical repair shops, and in the adjacent building, which is 50 ft. wide and 260 ft. long, are located the carpenter shop, blacksmith shop and insulator shop.

These four units are inter-connected with a standard gage transfer track over which is operated a 15-ton transfer car for transporting material and equipment between departments.

The buildings are separated with 40-ft. driveways which are on a level with the floor of the buildings and connected with the 50-ft. drive on the north and by ramps to the roadways on the south.

Fig. 3. shows the open shed storage platform, which is 80 ft. wide and 400 ft. long with a car-loading platform 11 ft. 6 in. wide, extending the full length of the building with a 40-ft. ramp approach from adjacent roadways at each end of the platforms. A section of the building is completely enclosed and is used as a high-voltage insulator testing department, while the remainder of the storage space is used for storage of bulky material such as reels of cable, switches, and insulator equipment. A double spur track extends along this building providing for the use of the 10-ton Brown hoist in handling materials. Fig. 4 shows the insulator test department during the course of a series of tests.

The salvage stores building is 100 ft. square with two truck-loading platforms 11 ft. 6 in. wide and one car-loading platform 30 ft. wide extending the full length of the building. This department serves as a clearing house for all materials and equipment that are scrapped, sold or salvaged. The adjacent reclamation shop is on a ground level, and is 30 ft. wide and 60 ft. long. It is used in connection with the repair and salvaging of usable materials.

The Oil and Paint House

The reinforced concrete oil and paint house is 40 ft. wide and 150 ft. long and is centrally located with respect to the plant as a whole. One section of this building is used for storage of paint materials, and the remainder of the building is equipped with oil headers, circulating pumps, oil filter, oil separators, drum-drying equipment and measuring tanks for filling oil drums with transil oil and switch oil. Fig. 5 shows the interior of this building.

The ninth unit consists of a concrete pump house, a 200,000-gal. concrete reservoir, and a 100,000-gal. steel water tower, 140 ft. high, maintaining a constant pressure on fire hydrants and overhead sprinkler system. The pump house is equipped with two fire pumps with a capacity of 750 gal. per min. at a pressure of 250 lb. per sq. in.

The tenth unit consists of a frame and stucco hospital building on Marengo Avenue, located opposite the main stores building and facing the 50-ft. driveway.

The buildings were designed for simplicity, economy and ease of handling materials and equipment. The construction consists of concrete foundations to the floor line with a light structural steel framing for the superstructure. The steel framing for the stores and test departments is shown in Fig. 6. The stores department is 200 ft. wide and is spanned with five 40-ft. roof trusses with glazed monitor construction providing sufficient light and ventilation for the center aisles of the buildings. The structural steel framing in the stores building weighs 428 tons or an average of 8.7 lb. per sq. ft. of covered floor area. The front section of the building is of two-story construction over the center bay, giving a total second floor area of 2,400 sq. ft. for recording-room storage space.

An 8-in. concrete wall is carried 4 ft. above the floor line to the bottom sash line. Above this point the sides of the buildings are enclosed with glazed steel sash to the bottom cord of the roof trusses that is 13 ft. 4 in. above the floor line.

The roof and gable ends are covered with No. 22 gage galvanized corrugated sheet metal, with the exception of the front of the buildings facing the private driveway that are finished with stucco shown in Fig. 7. It will be noted that the main entrances to the buildings are on a ground floor level, whereas 215 ft. south of this point all floors are 4 ft. above adjacent roadways, thereby taking advantage of the natural slope of the ground to place all offices on the ground level and loading platforms at truck and car height.

The floors of all buildings are constructed of 6-in. reinforced concrete, the surface being treated with a liquid floor hardener to prevent dusting and wear

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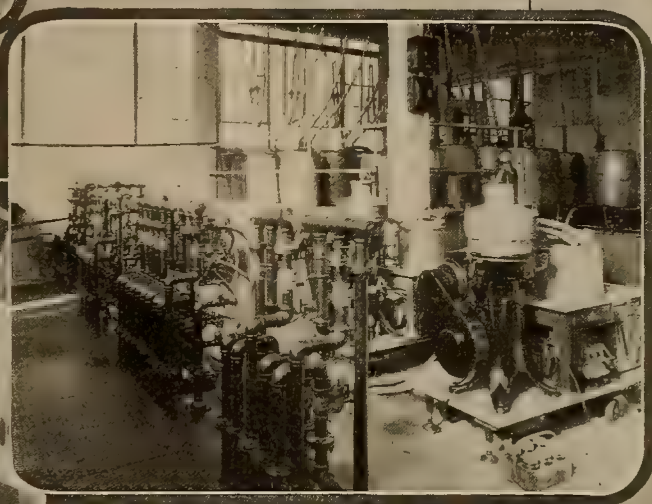

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THE accompanying views show some of the features of the new plant. Fig. 2 is an air view of the loading platform for the test and transformer storage departments and gives an idea of the amount of equipment held in storage. Fig. 3 shows the method of unloading and storing large transformers. The method of testing insulators and some of the equipment used for this purpose are shown in Fig. 4. Elaborate facilities have been provided for handling and storing transformer and switch oil. Fig. 5 shows some of the pumps, a De Laval oil purifier, and the section of this building devoted to washing and drying oil drums. This department is also equipped with filters. All the buildings were designed for simplicity, economy and ease of handling material and supplies. Fig. 6 shows the steel framing for the stores and testing departments during the course of construction. Even during erection the most modern methods and equipment were used.

and tear on the floors. In the office section of the three major departments the concrete floor slab is finished with a 3/4-in. topping of mastic flooring for the comfort of office employees.

Each department has certain special features and equipment that are worthy of mentioning, as the ultimate result means low cost of operation and handling materials.

The stores department employs a Type "H" electric Mercury tractor and a series of 25 Mercury trailers for transporting material from one department to another and from the storage bins to the shipping room. This method of transporting material within the plant over a territory of 15 acres is speedy and economical. Fig. 8 shows the truck.

The stores department has the receiving and shipping point for all the heavy transformers at the transformer storage platform, which is equipped with a 40-ton crane extending beyond the platform a distance of 40 ft. for loading and unloading truck shipments. This crane also extends into the test department over the assembly and testing pits. The 15-ton transfer car is used chiefly for transporting heavy equipment between the electrical repair shop and the test department. Fig. 9 shows the test department with a transformer in the test pit.

Power Source and Equipment

A 15-kv. substation with two 15-kv. emergency lines and three 1,000 kva. 15,000/2,300-volt transformers is the source of power for the test department and plant as a whole. This station is equipped with a 15-kv. and 2,300-volt bus, a secondary bank of power transformers of 300-kva. capacity, 2,300/220/110 volts and a secondary bank of lighting transformers of 225-kva. capacity, 2,300/220/110 volts.

The test department is also equipped with a high-voltage testing transformer capable of developing 500,000 volts for testing 220,000-volt transformer bushings immersed in a cylindrical steel-lined oil pit 15 ft. deep. All 220 and 110-volt testing circuits are run in open cable and wire ways in order to have ready access to different sections of the building for additional testing circuits.

As a matter of safety and convenience, all highly specialized testing work is carried on in isolated sections of the building and of necessity the building is divided into many special sections by means of partitions.

The central telephone switchboard and equipment are located in this building, and all telephone circuits and alarm signals radiate from this point. All locker rooms and assembly rooms are located on the second floor, which has a total area of 3,200 sq. ft.

Electrical Repair Shop

The electrical repair shop is equipped with modern coil-winding and wire-insulating machines, a 3-compartment electric bake oven, concrete assembly and repair pit, and a truck-loading space in line with the 15-ton crane for shipments which are made directly to the shop department. The shop is completely equipped for handling all major and minor electrical repair work.

The mechanical shop is equipped with a 5-ton overhead traveling crane and all necessary machinery and equipment for mechanical repair work and manufacture of special mechanical fittings for substation and construction work.

The plant is well equipped for handling the large amount of transformer and switch oil that is required throughout the system. The oil pump house is equipped with five 2-in. oil circulating pumps, connected through a series of valve headers and piping to the eight oil storage tanks, car-unloading stations, test-department transformer pits and to the drum-emptying vats in the transformer storage platforms. The oil house is also equipped with 12-in. filters, DeLaval oil separators, oil drum-drying equipment, and a steel measuring tank for filling oil drums. (See Fig. 5.)

Fire Prevention System

The plant is equipped with a complete modern fire protection system. A series of 8-in. and 10-in. underground fire mains is laid throughout the plant for supplying fire hydrants and the automatic overhead sprinkler system which is installed in each building. A 100,000-gal. steel water tower maintains a pressure of 60 to 65 lb. per sq. in. throughout the plant at all times, and in addition there is a reserve storage of 200,000 gal. in the concrete reservoir in case of a failure in the supply in the city fire mains. Two high-pressure fire pumps capable of delivering 750 gal. per min. at a pressure of 250 lb. per sq. in. discharge into the fire mains from the reservoir.

The pole-treating plant, which was constructed prior to the new warehouses and shops, is equipped with two 10-ton Brown hoists which are used to great advantage in the handling of materials and the switching of cars within the plant on company-owned spur tracks, as shown in Figs. 10 and 11.

The roadways are constructed of 12 in. of decomposed granite with concrete approaches for the main entrances and ramps and concrete curbs and gutters along the building lines. With this system of well constructed roadways it is possible to use the electric tractor and trailers for transporting materials between buildings.

The construction of this plant was a very fast and ecenomical job. Construction work was started on Sept. 3, 1923, and on July 1, 1924, all buildings were completed and the moving of the departments into their new location took place during July, 1924.

The plant was built as a combination day-labor and contract job, the construction department of the Southern California Edison Company acting in the role of "General Contractors" and carrying on such work as excavation, forms, concrete, special oil piping and substation construction on a day-labor basis with the company's construction forces. The remaining 50 per cent of the work that was more highly specialized was sub-let to local firms on a contract basis.

This plant is modern and up-to-date and is planned and equipped for the economical handling of the large quantity of material and equipment that is required by the Southern California Edison Company in connection with the rapid growth of the distribution system supplying power in the central and southern section of the state of California.

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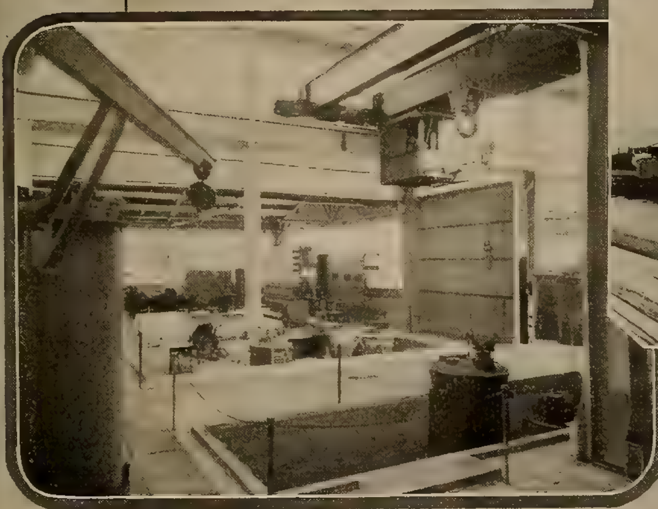

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THE entire plant is modern in every respect. The buildings fronting on streets of Alhambra are finished with stucco, as shown in Fig. 7. The remainder is finished with galvanized sheet metal. Modern methods of transportation are employed. An electric tractor and twenty-five trailers are employed for transporting materials between departments as shown in Fig. 8. Facilities have been provided for testing equipment of all classes. Fig. 9 shows a portion of the test department with a transformer in one of the pits undergoing tests. Cranes are used throughout for transporting heavy equipment. One of the most extensive departments of the plant is devoted to pole storage and treating. Fig. 10 shows the method of loading and unloading poles. Fig. 11 is a general view of the pole-treating plant with the treating plant in the right center. An idea of the number of poles kept on hand may be gained from the number of piles shown.

Suggestions on Proper Office Lighting

By H. C. Barnard

Sales Engineer, Curtis Lighting of California, Inc., San Francisco

ONE of the principal responsibilities of the electrical industry is to see that the equipment it manufactures, sells, installs and furnishes energy for is properly applied. In the field of office lighting there is much work to be done. In this article the author discusses proper office illumination with special emphasis on the choice of such fixtures as will fit most economically a particular case and at the same time give the most efficiency. Glareless lighting with a minimum intensity of 5 foot-candles for general lighting and intensities ranging from 10 to 15 foot-candles where considerable work is to be done are recommended.

STATISTICS from reliable sources show that one out of every eight persons suffers from eye-strain caused by improper illumination. This strain is reflected in headache, depression, impaired efficiency, nausea, absence from work and other forms of personal and economic loss. It is, too, responsible for the increasing use of eyeglasses and for the seeming dullness of many school children.

Unfortunately many executives fail to recognize the importance of good lighting; happily, the number of such individuals is steadily and rapidly decreasing. It has been recognized long since that there are separate and distinct types of office equipment for individual purposes, and now it is being acknowledged that there are essential differences in lighting units. This awakening to the importance of the use of the proper lighting fixtures for specific working conditions is resulting in improved health, increased efficiency, better working conditions, increased output with corresponding lowered cost of production, greater safety of operation and improved morale.

The application of the proper lighting unit to office work is particularly important. Generally all of the planning, routine and executive work is done in the office of a company, and anything that tends to interfere with the smoothest functioning of office forces is reflected all along the line of production. This, in turn, has its definite effect on profits. Great care has been given to the selection of office machine and desk equipment, with results too well known to need exposition here, and, fortunately, similar attention now is being paid to the matter of illumination. Obsolete and inefficient equipment is being discarded in favor of lighting units designed for specific application and for the scientific use of light. For that reason alone it is important that electrical men generally and contractor-dealers in particular take pains to inform themselves as to the various types of lighting equipment and as to their applications.

There are two prime requisites to a proper lighting installation. First must be considered the matter of quantity of light. By this is meant the intensity of illumination. In offices this quantity of light is usually measured at the desk level on account of the fact that most of the time is spent and work done at the desk. The intensity at all times must be sufficient for the work to be done; it should never be too great nor too little as either of these conditions will cause fatigue. The second consideration in a lighting system is quality of light. This quality is affected by several things, the chief of which is glare. Glare in iself, is divided into two classes; first, the direct, bright light that comes from a brilliant lamp or light source, and, second, the annoying reflections that come from the polished top surface of a desk, from glossy paper or from plate glass. Both forms of glare should be eliminated entirely for the most efficient and most comfortable lighting of any interior. Glare causes eye-strain and the eye, thus taxed, fatigues very easily. This strain, long continued, results in extreme discomfort and eventually impaired vision. Glare is often responsible for the extreme physical exhaustion noted among office employees and is largely responsible for the so-called "three o'clock headache" and for the extensive use of eyeglasses.

Good lighting can be judged best perhaps by the way it helps one to see. Merely because a light is brilliant does not signify that it is giving good illumination. It may be producing too much light improperly applied. On the other hand, a well shaded lamp may look dim in the general room illumination scheme but may give excellent light for reading. A bright light fairly in the field of view means a bright light on the retina of the eye, and this in time will produce fatigue. The iris of the eye tries to shut out the bright light and in so doing renders less visible all things not so highly illuminated. A good example of this is the experience one encounters when looking at the sun upon the water or when looking into an automobile headlight at night. Another good example of glare is given by an unshaded lamp immediately before the eye. If one tries to read under such lighting it is found to be almost impossible to do so, but when the eye is shaded from the glare of the light reading becomes at once much easier.

The importance of proper lighting has proved so great that many of the larger concerns in this country have devoted extensive study to the subject. This often has been occasioned by the large number of employees involved and by the number of lighting

A typical small office properly illuminated. The picture was taken without the aid of any light source other than the lighting equipment. Note the absence of glare.

units required. These tests generally have involved a detailed study of all available types of fixture, or luminaire, looking to the proper intensity, the elimination of glare and the best general illumination for all purposes. Types of fixtures have been installed and tried out under actual working conditions, and the number required for the best distribution of light has been carefully determined. The decisions resulting from such experiements have produced good lighting for the work to be done and have been largely responsible for improved employee welfare and increased efficiency.

In general it may be said that the problem in all lighting installations is the same: to get adequate illumination on the working plane, which in offices is usually at the desk or table top. This is normally about thirty inches from the floor. The tendency is to illuminate offices from a general lighting source without the use of drop cords or lamps hanging over desks, filing cabinets and tables. The general trend

The auditing department in the new Pacific Gas and Electric Building, San Francisco, showing proper illumination for an office of this size. No additional lighting was used to take this picture.

seems to be away from desk lamps and individual light sources. One reason for this procedure is that general illumination tends to eliminate the bright reflection and glare from desk tops and paper that so often accompanies the desk type of lighting. Another reason for general lighting is that it most nearly approximates daylight. Inasmuch as daylight is the best form of lighting, that form of artificial light that most nearly approaches natural lighting is bound to prove best.

There are many types of general lighting fixtures to select from. It is largely a matter of individual choice and of adaptation to the specific installation. The most favorable installation condition is perhaps that where the walls are finished in color and appearance similar to the ordinary United States one-cent post card. With such a wall finish indirect lighting ordinarily produces excellent results. The principle of indirect lighting is to use the ceiling for diffusing the light throughout the entire room. This type of installation requires fewer fixtures because each unit is using the proper reflecting surface for employing the light from a powerful lamp. When

The drafting department in the new Pacific Gas and Electric Building showing the effect of proper illumination. The intensity in this room is approximately 20 foot-candles.

properly installed, indirect lighting gives illumination free from glare and shadows and is as near daylight as to date it has been possible to attain. Offices lighted by the indirect system are usually free from glare on desk tops, papers, or at the light source itself, and the eye thus is permitted to function at maximum efficiency at all times.

Because of ceiling construction or color it is impossible to install indirect lighting in some offices. However, such cases are becoming increasingly rare. Where they do occur it is usually good practice to install an enclosing type of unit that completely conceals the bright lamp. Such a fixture should not be so designed that it is merely an enclosure for the lamp but should be such that it serves to diffuse or direct downward on the working plane most of the light rather than to spread the light laterally to the walls. It is not always possible entirely to overcome shadows with this type of semi-indirect lighting un-

less two or more lighting units are used. With this system the glare from desk tops can be eliminated only by careful spacing of office furniture.

A fast disappearing type of office lighting is that employing open shades. In almost every case where this type of lighting is used more outlets are required and desk lamps have to be used as auxiliary light sources. From the point of view of fixture cost alone this type of installation is often the cheapest, but when consideration is given to all factors such as health and efficiency, generally it is found that such installation is not cheap.

There is, of course, no general rule to be laid down for the lighting of offices. So many factors affect the situation that lighting always becomes an individual problem. The essentials, however, are always the same. First, the lighting system must conform to the wiring scheme of the building in order not to increase the wiring expense; second, an even distribution of light with sufficiently high intensity must be obtained; and, third, glare must not be permitted to interfere with personal efficiency. For these and other reasons it is impossible to lay down any definite rule for the lighting of offices. The size of bays, ceiling heights, wall and ceiling colors and many other items must be taken into consideration in planning the illumination. The best way is to make a plan view of the premises and to lay out on this plan the proposed location of lighting fixtures and all proposed electrical outlets. In a building already completed it is a good idea to try different styles of fixtures and to place these trial units at different locations for a determination of the best general illumination results. This procedure will furnish the following general information:

1—The desirability of spacing for fewer fixtures.

2—The general effect from the employees' efficiency and welfare standpoint.

3—Advantage of better arrangement and appearance.

4—Current consumption and cost for maintenance.

5—Initial cost for wiring for new equipment.

Lighting-equipment manufacturers generally maintain staffs of lighting engineers for giving suggestions and technical advice relative to the proper application of their equipment for its most intelligent use and the most satisfactory service. This engineering service makes for improved lightin, helps to increase employee efficiency and is particularly valuable in the case of large office buildings and factories. On all new buildings the lighting may be planned best by such an illumination engineer.

Fixed Capital Accounting

By J. G. Hawkins*

Supervisor, Statistical Bureau, Pacific Power & Light Company, Portland, Ore.

FIXED capital accounting is a term commonly used in referring to the method of recording the investment in fixed capital useful in the conduct of the business of a corporation. The fixed capital of a public utility corporation is the more or less permanent property having an expected life in service exceeding one year from date of acquisition or installation. The importance of keeping accurate account of the capital investment always has been recognized in the public utility industry. Before the advent of commission regulation each company kept fixed capital accounts under its own method. Utility companies in a majority of states are now required by law to keep all accounts in the form prescribed by a public service commission. The prescribed method is outlined in considerable detail in the uniform classification of accounts published in book form by the state commission, and requirements of the classification have resulted in better accounting methods and accentuated the importance of accurate fixed capital records.

Fixed Capital Defined

Fixed capital may be tangible or intangible. Intangible fixed capital may consist of organization expenses, development costs, franchises, patent rights, and long-period leaseholds. Tangible fixed capital consists of land, buildings, generating equipment, transmission systems, distributing systems, miscellaneous equipment, and overhead costs. Overhead costs may be defined as engineering and superintendence, law expenses during construction, injuries and damages during construction, taxes during construction, interest during construction, and miscellaneous construction expenditures not assignable to other specific construction accounts. The words "during construction" are added in each instance because after the property is placed in operation all the expenditures just enumerated must be charged to operating expenses.

Changes in fixed capital result from additions, betterments, replacements and retirements. Additions comprise land, structures, equipment or other properties added to those in service and not taking the place of any like property previously owned by the company. Betterments are mechanical changes in structures, facilities or equipment for the purpose of making the property more useful or of greater capacity than at the time of original installation or acquisition. Replacements consist of additions to fixed capital made for the purpose of substituting one building, structure or piece of equipment with another of substantially the same size or capacity which has been retired because worn out, obsolete

*Extract from lecture delivered to a class of employees of the Pacific Power & Light Company, as a part of the regular educational course offered.

or otherwise rendered useless. The extension of the life of a franchise or patent right also may be considered a replacement. Retirements are withdrawals or removals from fixed capital, or property sold, destroyed, abandoned, or lost and not replaced by any new construction or property.

There is considerable variation in the interpretation of the point dividing maintenance and reconstruction, and the determination of that point is within reasonable limits a matter of company policy. Maintenance is commonly defined as expenditures necessary to maintain the tangible property in a state of operating efficiency and the substitution of new parts wihch do not result in a substantial change in identity in any particular unit of property. It is important that no expenditures be charged to fixed capital for repairs or minor changes which do not alter the identity of the property. Charges for repairs and minor renewals should be charged to maintenance accounts under operating expenses.

The uniform classification emphasizes the importance of crediting the fixed capital account with the original installed cost of any property which is worn out, lost, sold, destroyed, abandoned, surrendered upon lapse of title, becomes permanently unserviceable or is withdrawn or retired from service for any other reason. The installed cost is construed to include such part of the overhead costs as is equitably assignable to the item retired.

Composition of and Reasons for an Adequate System

A complete fixed capital accounting system should include a manual of accounting outlining the system and detailing routine instructions for preparing the records both in field and general office; a classification providing a separate account for each class of construction with symbols for distinguishing charges to construction, reconstruction and maintenance; construction ledgers for summarizing the cost of classifications under each expenditure requisition; subsidiary fixed-capital ledgers to reflect the cost of property of each class by localities; and an inventory of all property by units. A record of the amount of property expenditures available for additional bond issues, termed the fundable property record, also should be maintained.

It is imperative to maintain the integrity of the fixed capital account which is the foundation supporting the whole accounting structure. An efficient fixed-capital accounting system provides a number of safeguards for the company, the stockholders, the bondholders, and the public, among them being the following:

1. Prevents the establishment by the management or a regulatory body of a rate lower than is warranted, which would result in actual loss to stockholders.

2. Prevents an over-issue of securities resulting in an undue burden of interest and dividend charges.

3. Prevents an erroneous statement of property values in tax matters.

4. Furnishes the basis of reports to the security holders showing the true financial condition of the property in which they are investing their capital.

5. Prevents improper charges to fixed capital which should be distributed to operating expenses, and vice versa.

6. Prevents failure to provide a sufficient amount of reserve to cover the replacement and retirement of property worn out, obsolete or inadequate.

7. Provides a basis for determining insurance valuations in case of fire loss.

8. Facilitates the certification of construction expenditures for additional issues of mortgage bonds.

9. Improves the general company administration by furnishing dependable information to company officials.

10. Protects the public against unjust rates based on erroneous property values.

These useful purposes appear to be sufficient to justify the special treatment accorded fixed-capital records entailing a vast amount of accounting work.

Some Details of Operation of an Adequate System

The by-laws of a public utility corporation usually provide that changes in fixed capital must be authorized by the board of directors. To advise the directors, executive and financial officials of the company as to the estimated requirements in fixed-capital additions, extensions and betterments for approximately a year in advance of actual construction, it is usual for the operating officials to prepare a construction budget. The function of a budget is to indicate to the board in concise form the future financial needs of the company to meet known and existing conditions, together with the necessary additional investment required to take on prospective business; and to exercise control over those expenditures when approved. The items listed in the budget for approval are generally termed "budget projects." When a "budget project" has been approved it is the common practice to issue some distinguishing authorization bearing a serial number, sometimes called an "expenditure requisition," and thereafter to use that number as a reference on all records pertaining to that particular project. The purpose of an "expenditure requisition" is to show in concrete form the details of proposed expenditures affecting acquisition, construction, reconstruction, or extraordinary maintenance; to provide detail cost estimates thereof; to set forth the reasons or necessities for doing the work; and to check the actual earnings derived from the particular extension or addition. The purpose of the detailed estimate is to permit the comparing of the estimated and actual cost; to determine that all charges are entered on the books, that the entries are properly classified and that the charges are not excessive; and to provide a basis for estimating the cost of future projects of the same class.

Some "budget projects" are issued for a specific installation, such as a new generating plant or transmission line. Others are in the nature of blanket authorizations covering miscellaneous small additions to the distributing systems and purchase of meters, transformers, office furniture and fixtures, tools and garage equipment for the current year.

When construction has been started and expenditures incurred a separate construction ledger is opened for each "budget project." The ledger is further divided in accordance with the construction

accounting classification or by work orders issued for each class of construction. To produce construction ledgers of the utmost value requires a detailed entry fully describing all items of material and equipment installed; an accurate segregation of labor charges according to each division of the work; and a proper distribution of the overhead charges. The entries to the construction ledger originate from workmen's daily time tickets, store-room requisitions, invoices covering purchase of material and equipment, automobile truck trip slips, disposal orders covering property retired, and journal entries for interest during construction and overhead charges in amounts applicable to the particular project.

Before "expenditure requisitions" for individual "budget projects" are transferred to fixed capital and retirement reserve accounts the expenditures should be analyzed and the actual cost compared with the estimated cost. Any discrepancies should be investigated and a satisfactory explanation of the differences supplied by the engineer in charge of construction.

When the cost covers both new construction and reconstruction the cost of reconstruction is transferred from the "expenditure requisition" to retirement reserve or to surplus, in accordance with the policy of the company. Construction records kept in accordance with the "expenditure requisition" plan will provide a complete description of the charges and credits representing changes in the fixed capital account.

After the "expenditure requisitions" have been analyzed, the cost of each unit should be recorded on a property inventory which may be in the form of a book or card record. A complete property inventory can be prepared without difficulty when the preparation of it is started from the time of organization of the company. The majority of public utility corporations are successors to companies which were incorporated before standard classifications were developed, and in many cases the present corporation does not possess the original records of the old company. If it is impossible or impracticable to reconstruct the old records in conformity with present classifications, the property may be inventoried and appraised on the basis of estimated original cost, and that valuation used for the allocation or distribution over the new fixed capital accounts. Any difference between the appraised value of the physical property and the book value should be classed as intangible fixed capital. Such an inventory will be valuable for many purposes. It will show the stockholders and directors what is included in the capital account; it may be used in tax, rate and capitalization cases; it will reflect the amount of intangibles capitalized; and it will make available the age and cost of each unit when it becomes necessary to consider the subject of depreciation.

Teaching the Fundamentals of Better Lighting

As a result of the two lighting schools conducted by the Pacific Coast Electrical Association, 103 men vitally interested in illumination were given the opportunity to study the fundamentals in modern lighting. That the information passed on to these men was exceedingly valuable is vouched for by the highly complimentary remarks sent to the committee in charge following the closing of the Los Angeles and Oakland schools. The lighting bureau under the chairmanship of Hugh Crawford sponsored the schools which were supervised by Clark Baker and H. H. Allison.

The schools were designed primarily to give up-to-date practical information and data on lighting to those who come in actual contact with lighting installations, namely, the electrical contractor or his estimator, together with the jobber's salesman. Architects, engineers and central station men also were invited to enroll in the schools. Arrangements for the courses provided for a school in the southern part of California and one in the San Francisco Bay region. The southern school was held in the Los Angeles Gas & Electric Company's building Jan. 19-30, and the second course was given in the Oakland building of the Pacific Gas and Electric Company, Feb. 4-13.

Preparations for the schools included the assigning of definite subjects to the instructors, all of whom donated their time to the schools in the interests of better illumination. The course was based on the National Electric Light Association Lighting Sales Course, Part 2, with all of the technical engineering features omitted. Instruction in the two schools was practically the same and covered the following subjects:

1. Introduction—Value of lighting to the electrical industry
2. Illuminants
3. Illustration of definitions and terms
4. Illustration of diffusion of light
5. Calculations
6. Demonstration of industrial lighting
7. Store lighting
8. Demonstration of store window lighting
9. Demonstration of color lighting.
10. Illustration of office, school, church and auditorium lighting
11. Residence lighting
12. Illustration of street lighting
13. Special lighting — outdoor sports, signs and flood-lighting.

Wherever possible the material given to the students in the course was either illustrated or demonstrated in order to present a more definite picture of what was considered to be modern practice. Lack of funds limited the amount of demonstration material available, but despite this a clear conception of the vital points of the course was given the students.

Enrollment in the schools was limited to fifty before the classes were opened to registration. The purpose of this was to limit the groups to such size that the instructors could keep in close personal contact with the students. As the courses were designed primarily for the contractors, the largest enrollment was expected from that group and invitations to each school were divided as follows:

Electrical contractors	25
Jobbers' salesmen	10
Architects and engineers	10
Central station men	5
Total	50

Attendance at the two schools was divided among the various interested men in about the same relation and the combined registration was made up as follows:

Electrical contractors	38
Jobbers' salesmen	30
Architects and engineers	5
Central station men	20
Fixture manufacturers	6
Miscellaneous	4
Total	103

In an endeavor to make the lighting schools of the most value to the students taking the courses, Mr. Baker and Mr. Allison, chairman and vice-chairman of the committee in charge, made the ruling that each student upon enrolling in the school should make a deposit of $20 as a guarantee of his attendance at the scheduled class meetings. In case a student missed a meeting of the class $2 was forfeited for each absence, and the balance of the deposit was returned at the conclusion of the course. This deposit was the only money that was asked of those taking the courses. In other words, there was no charge for attending the ten sessions, but if a student enrolled it would cost him money to miss any of the lectures.

This regulation was adopted principally to ensure attendance at the meetings of the classes for the good of the students and to justify the expense involved in the preparation of the course. Attendance was entirely satisfactory to those in charge of the schools. In Los Angeles 96 per cent attendance was secured for the ten sessions, and in Oakland the attendance record for the entire course was 97 per cent. Classes were held on alternate afternoons and evenings, thus not taking up the entire working time of the students.

The courses, as shown by the list of subjects, covered the basic principles of modern illumination. While the instruction was not designed to give the students a complete knowledge of lighting, the purpose was to present the elementary principles to which supplementary information could be added later. Through the medium of lectures and demonstrations these elementary principles were presented. Solving problems in which the students set down what they have learned showed them the proper methods of laying out lighting for a variety of installations. Although no examinations were planned for the courses, the students evidenced such an interest in this phase of instruction that a written examination was given as the concluding piece of work.

Instruction in the Los Angeles school was given by members of the Los Angeles chapter of the Illuminating Engineering Society. The school was under the direction of Clark Baker who was assisted by W. L. Frost, W. A. Alden, L. A. Hobbs, Thomas Hunter, H. J. Mayo, D. C. Pence, and F. VanGilluwe, all of whom are members of the society. A. E. Hoare, executive secretary of the California League for Conservation of Vision, delivered a talk on "The Eye" at a special meeting of the class.

The Oakland school was conducted under the direction of Mr. Baker, assisted by H. H. Allison, C. E. Cook, Carl Martin and R. S. Prussia, all members of the Bay Cities chapter of the Illuminating Engineering Society. Dr. Percival Dolman, an eye specialist and member of the illuminating society, addressed the class on "The Eye," covering much the same ground as did Mr. Hoare in Los Angeles. Assistance in conducting the schools was given also by the field representative of the California Electrical Bureau.

That the lighting schools were successful was assured by the interest displayed by the students and the comments that have been received since the completion of the work. Central station company executives, electrical contractors, jobbers and those who were students in the courses have united in commending the idea of disseminating information through such schools. One of the leaders of the industry gave it as his opinion that the schools constituted one of the most successful things ever attempted by the Pacific Coast Electrical Association, and that following them there would be a definite call upon the association to follow up the work with other schools, which he believes will have a registration four times as large as the first two. Another executive stated that he knew of nothing the industry ever has undertaken in recent years that has been received as well and is bound to accomplish such beneficial results.

Continuation of the schools has been suggested by many of the students and others interested in the work. In many instances it has been suggested that secondary schools, designed to supplement the information presented at the first schools, should be opened to those students at the first courses. The organization of a permanent school of this type is heartily sponsored by several students and others conversant with the courses.

CENTRAL STATION CONSTRUCTION OPERATION AND MAINTENANCE

Bushing Current Transformer Standards Adopted

Connection Methods and Arrangements Are Standardized to Simplify Construction Work and Testing

By T. J. LOVELL, Engineering Department, Southern California Edison Company, Los Angeles.

Confusion and delay are found to have been caused by the lack of a standardized method of marking and arranging the leads of bushing current transformers on oil circuit breakers. In the interests of standardization and simplification for all parties concerned, the following method of identification is being adopted by the Southern California Edison Company.

Each bushing is given a number, these numbers being painted in plain sight on the breaker tank near the bushing. Each individual lead of each current transformer is marked with a designating numeral. "O" is reserved for the common terminal of all multiple-ratio transformers. The tap leads are each marked with a number corresponding to the ratio obtained from them. For instance, using leads "2" and "O" will give a 200/5 ratio, leads "3" and "O" will give 300/5, and so on.

Each lead of every current transformer is brought to a terminal board located in the mechanism-housing of the breaker. The terminals on this board are grouped in the same relative physical arrangement that the current transformers occupy in the breaker. The leads are marked with stamped brass sleeves, and the terminals are also stamped according to the above system.

Although the installation of current transformer terminal boards in the mechanism-housing is a rather new departure, this company feels that the additional convenience, not to mention the greater safety to the workmen, is ample justification. Since there is plenty of space available in the housings of practically all standard breakers the additional expense is negligible.

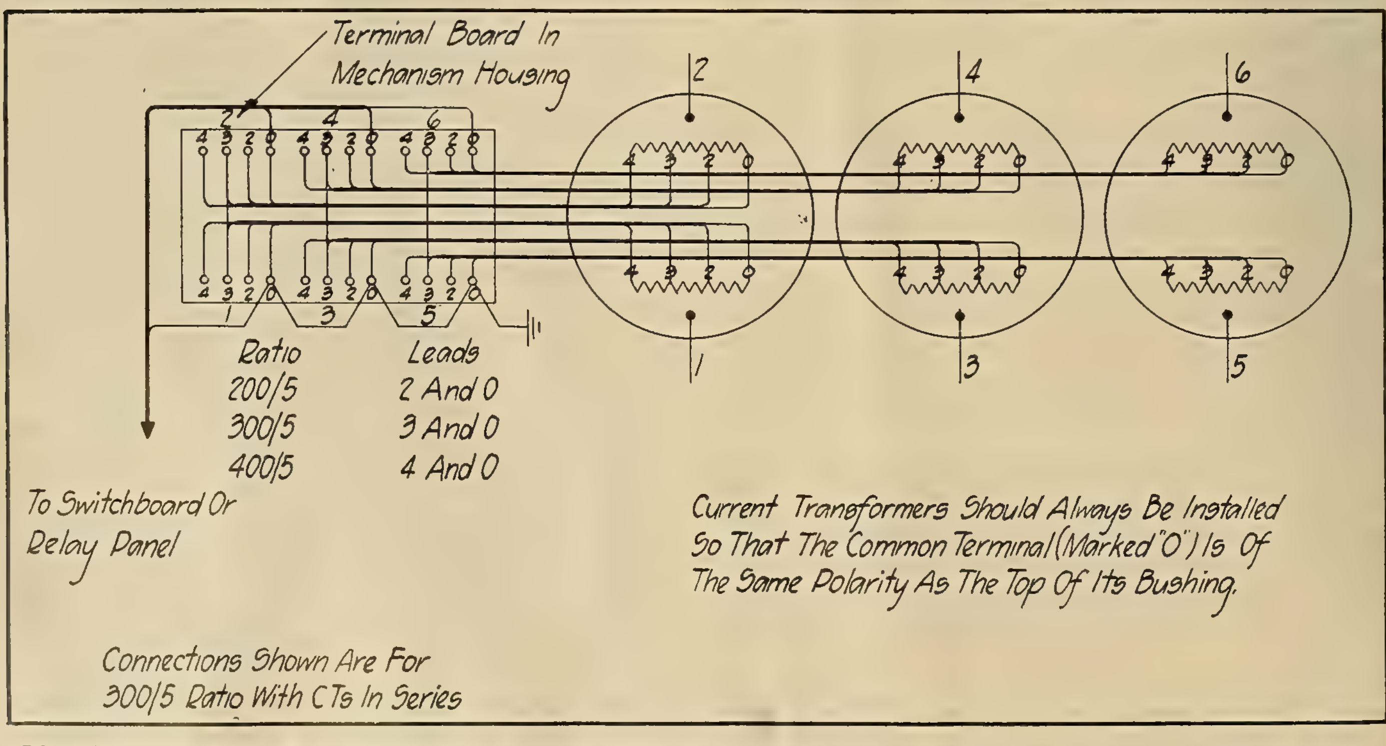
The construction department is given instruction always to install bushing current transformers (regardless of manufacturers' practice) so that the common terminal (marked "O") shall always be of the same polarity as the top of the bushing upon which it is mounted.

In the case of a breaker which has only three current transformers, the company's standard practice always can be followed by grounding the "O" terminals and selecting the tap lead to give the proper ratio. On breakers having six current transformers (with series connections) it is necessary merely to connect the terminals of the same number in the same group, viz, 3 to 3, and so on. One "O" lead of each group is grounded as usual, the other "O" lead being carried to the switchboard or relay panel. By following this system it never becomes necessary to ground a tap lead.

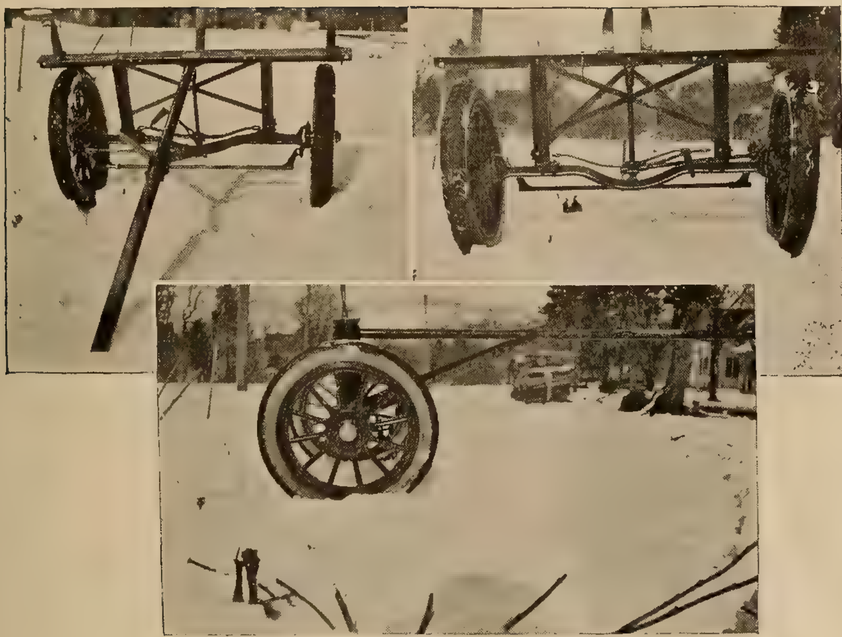
In case the current transformers are to be split into two groups, they are treated the same as described above for a breaker with three current transformers. Any special connection, such as delta connection for differential protection, can easily be made and readily inspected as the proper lead designation can be given on the three-line wiring diagram and the leads quickly identified on the terminal boards.

The advantages of such standardized scheme are readily seen, both to men who make the original installation and to those who later will inspect the breaker for the purpose of making tests, changing ratios, and similar works.

Some of the circuit-breaker manufacturers have already taken steps along the above lines, but apparently no effort is being made to co-ordinate their methods. If these manufacturers could get together on a standard scheme for accomplishing the results described in this article, it would be very much appreciated by the operatiing companies.



Schematic diagram showing the method of layout and connection of bushing current transformers that has been standardized and is being adopted by the Southern California Edison Company. The use of this method effectively does away with the difficulties formerly experienced through having bushing current transformers put into place just as they happened to come and depending upon selecting leads by test later on.



Three views of the completed trailer

Simple and Inexpensive Pole Trailer Easily Made

Necessary Piece of Line Crew's Equipment Readily Constructed at Shop from Miscellaneous Odds and Ends

By ALVA L. DAY, Line Foreman, Pacific Power & Light Company, Hood River, Ore.

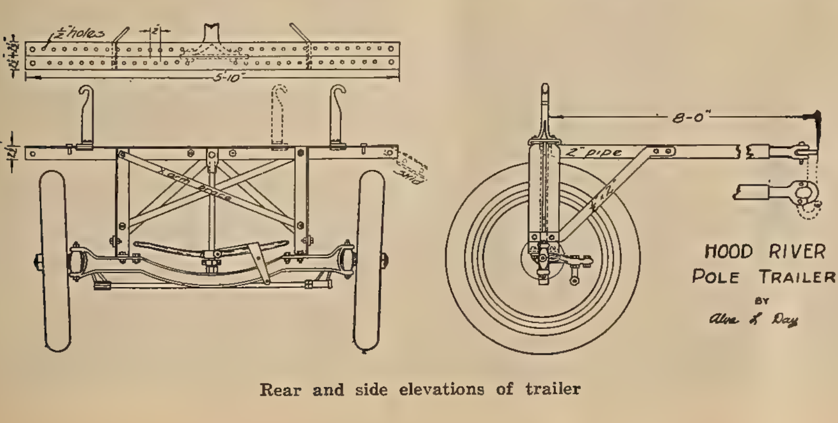
The principal features of the pole trailer made and used by the line crew of the Pacific Power & Light Company in the Hood River district, are simplicity and cheapness of construction, the utilization of materials at hand, and the control of the steering aparatus. The front axle and wheels from an Overland car wrecked by one of the local garages was chosen as the basis for the trailer because first it appeared to be strong enough to do the work, and secondly because it had wheels the same size as those of the Dodge service car used there, so that the old Dodge tires could be used on the trailer.

The frame, consisting of uprights and bunker, is made up of two pieces of 2½x2½x5/16-in. galvanized angle iron bolted together, and is sway-braced with 38-in. galvanized crossarm braces. The dimensions of the frame are governed by the axle used, in that the uprights are bolted to the spring seats and are high enough to permit the bunker to clear the height of the tire. The bunker is wide enough to clear the over-all width of the axle and wheels. The tongue is of 2-in. galvanized iron pipe, in the end of which is welded a coupling held closed by a pin drilled for a cotter key.

The steering lever attached to the tie-rod is normally set straight and held in that position by a staple hinged at the center so that it drops over the lever and the axle. Holes are forged in each end of the lever for attaching a hand line so that the trailer can be steered by a man riding in the back end of the car. However, on ordinary roads, where little steering is necessary, the steersman rides the load until a corner is reached when he dismounts and handles the steering lever from the ground. Of course the vehicle must be slowed down to a speed which will make this possible. The steering apparatus is particularly advantageous in backing the load into positions where a minimum amount of handling of the poles is necessary.

The load is held on the bunker between two upright iron guides so made that they can be slid along the entire length of the bunker and pinned at any certain point through ½-in. holes spaced on 2-in. centers. Either guide can be slid off the end of the bunker, so that in unloading a skid is pinned through a 1-in. hole in the end of the bunker and so placed that the butt of the pole can be skidded to the edge of the hole.

This trailer has been found to be a great labor-saver as well as a time-saver on the road. It is also made to carry, besides poles, other loads too bulky or heavy for the Dodge service car and in many instances has saved a second trip to or from a job.



Rear and side elevations of trailer

Starting Troubles Corrected by Increasing Air Gap

Not infrequently it happens that trouble develops in electrical equipment for which a ready remedy cannot be found in the experience of the repair man or in the literature of the industry. Such a problem presented itself in a certain industrial plant some time ago in starting a standard-make 75-kw. direct-current, 112 hp., 3-phase, 440-volt motor-generator unit.

In the starting position, with the half-voltage tap on the compensator, the motor took about 600 amp. or five times normal full-load current. It barely turned over and chattered violently. The unit was of the two-bearing pedestal type with the base firmly grouted in. The alignment of the stator frame was adjusted by means of shims to secure an even air-gap when the machine was at rest. When the unit was started the rotor apparently tried to cling to the top of the stator and rubbed against the stator iron.

It was thought that the current distribution in the winding, which was a two-path star connection, might not be equalized. An ammeter in each circuit and an equalizing connection between pole-phase groups eliminated this possibility. Evidently it was essential to remove all that was possible of the vertical movement of the rotating element in the bearings, present any possible shifting of the stator frame, and investigate any possible vibration of the shaft of the unit. After concluding this investigation and slightly increasing the air-gap at the top of the stator as compared with that at the bottom, the starting performance was somewhat inproved. However, the machine would not come up to speed on the starting position and took about four times normal full-load current at this position.

After consulting the manufacturers with regard to increasing the air-gap, it was found that this could be increased 0.012-in. without seriously affecting the performance of the motor. A cut of 0.012 in. was taken off the rotor iron in a lathe and the machine reassembled. After this operation, the machine quickly came up to speed on the lowest tap of the compensator with a maximum starting current of less than two times normal full-load current. Normal performance as to heating at full load was also shown.

Talk Is Indeed Cheap

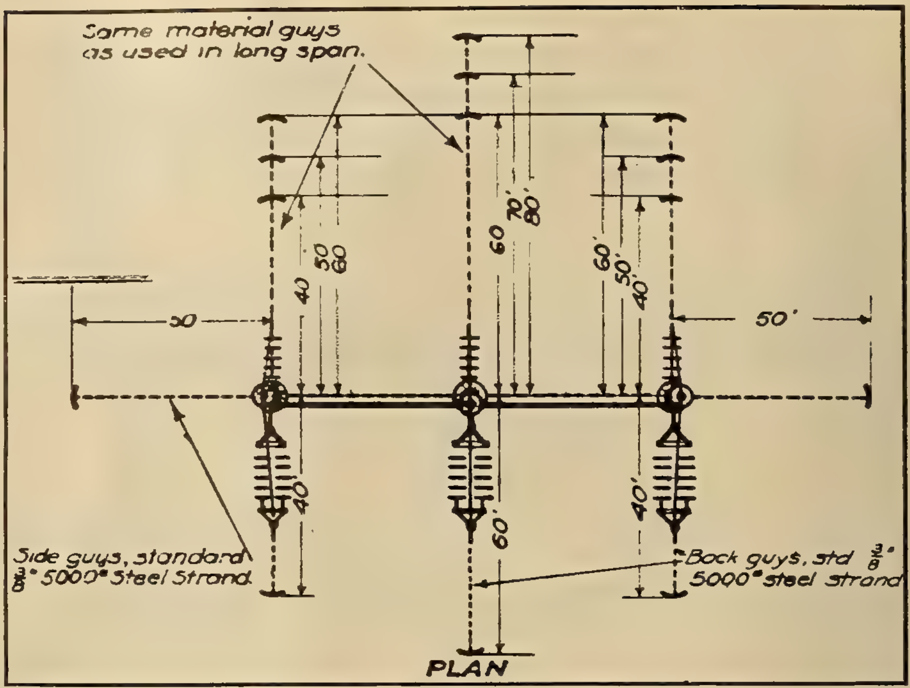
In ordinary speech only about one erg per second is converted into sound energy. With this as a basis and assuming that the average individual talks two solid hours per day, the average population of the United States since the Revolution to be 40,000,000, and that power is worth two cents per kw-hr., a little calculating shows the value of all the talking done in the history of our country to be $8.59.
—Radio Broadcast.

Wood Poles Used Successfully for Long-Span Service.

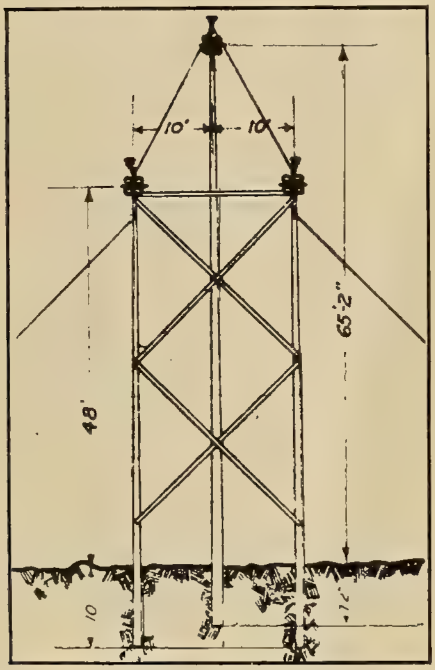
By A. S. GLASGOW
Assistant Superintendent Electric Transmission and Distribution, San Diego Consolidated Gas & Electric Company, San Diego, Calif.

A 66,000-volt transmission line from San Diego to Oceanside, Calif., was built by the San Diego Consolidated Gas & Electric Company. This line parallels the coast throughout its entire length and hence must cross numerous rivers and sloughs, most of which cannot be crossed with ordinary short-span construction because of seasonal flood waters.

The route of the line is of course free from snow and sleet. Temperature variations along the length of the line are not great, considered either seasonally or daily. Wind storms where the velocities reach really damaging proportions are not experienced in this part of the country. Taking all of the features into consideration, it was apparent that long spans could be carried successfully and economically on wood poles, using towers constructed of wood poles for the extreme spans.



Plan view of typical three-pole structure showing the general arrangement of all guys. It will be noted that inasmuch as these structures are used only for the longer spans a triple set of three guys each is used, one for each pole.

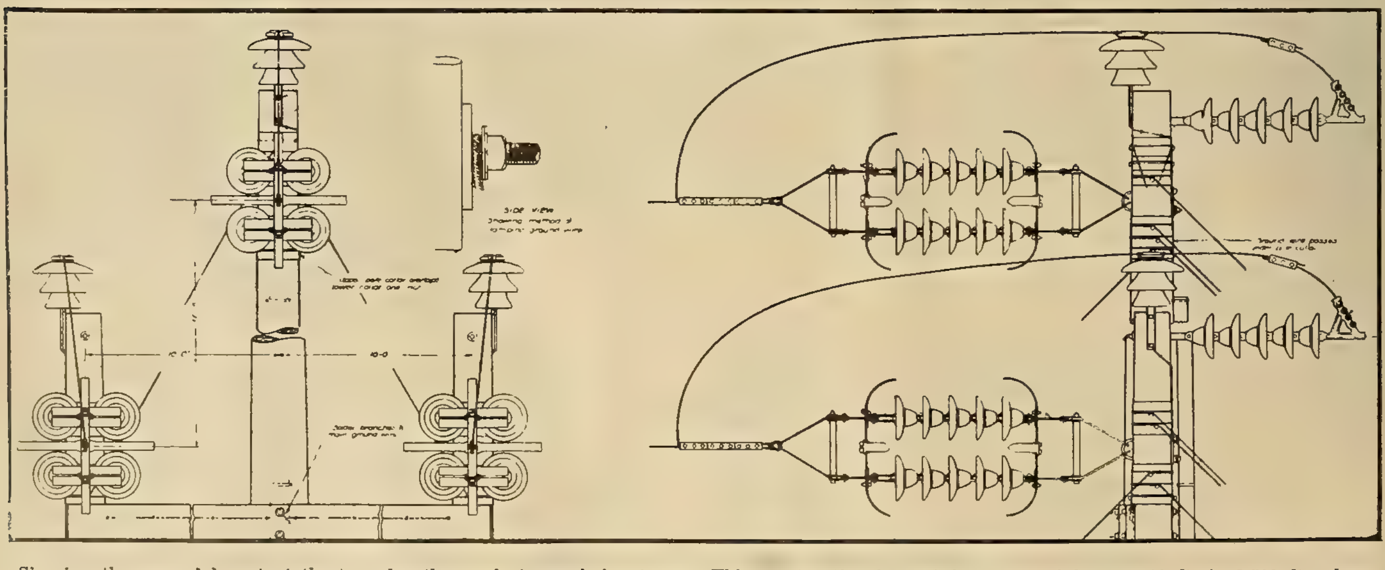


General arrangement of the three-pole structures showing the method of cross-bracing and side-guying.

These long spans have been in service for eight years. Only one or two cases of really serious trouble have occurred in that time, and the cause of that could be laid to the type of construction used; that is, trouble caused by a structure taking fire or by an insulator breaking down. Upon several occasions different spans have been damaged by airplanes flying into the line wires. One such accident occurred near the middle of a span and broke down a two-pole tower but did not uproot the anchors to which the guys were fastened. This of itself speaks well for the anchoring system used. The illustrations appearing with this article show the guying system.

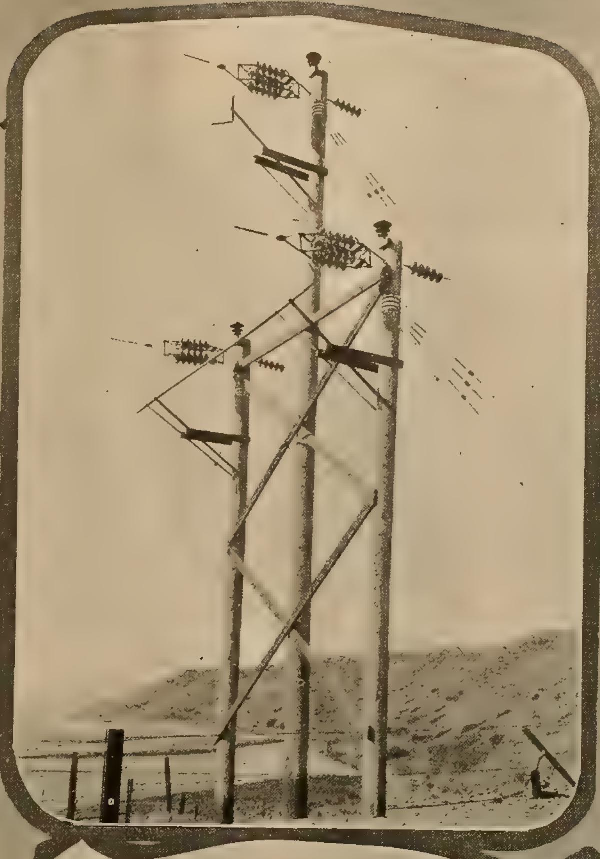
Construction and design data concerning the structures pictured on the adjoining page might be of interest. The major physical dimensions of the three-pole structure are given in the cuts appearing on this page. The conductor span attached to this tower is 3,379 ft. in length and comprises three 7/16-in. stranded steel cables drawn to tension of 7,300 lb. at 60 deg. with no wind. The sag is 81 ft.

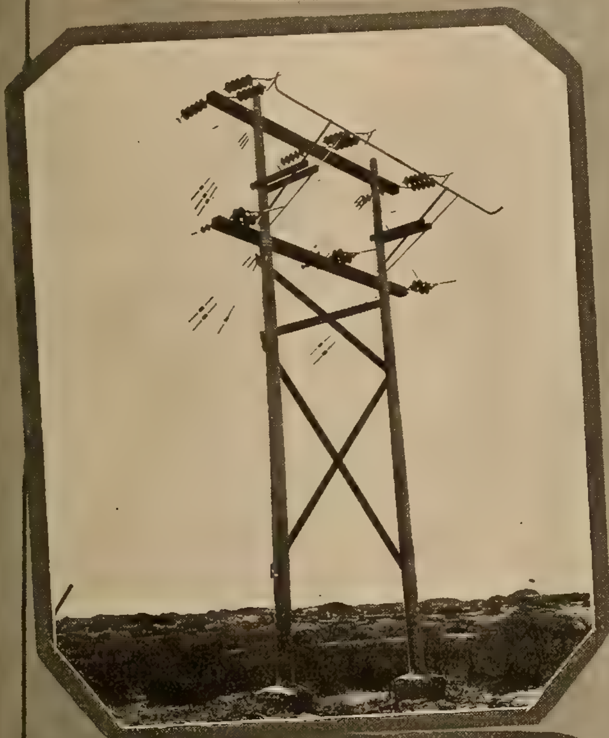
The two-pole structures are built of 60-ft. poles set 14 ft. 8 in. center to center and 10 ft. deep. There are three guys to each pole against the direction of greatest pull. These guys are tied to anchors located respectively 50 ft., 60 ft., and 70 ft. from the bases of the poles. Towers like these are used to carry spans of less than 2,500 ft. For such spans stranded steel cable of 3/8-in. diameter is used. This cable is drawn to a tension of 3,570 lb. For ordinary spans medium hard-drawn copper wire is used.

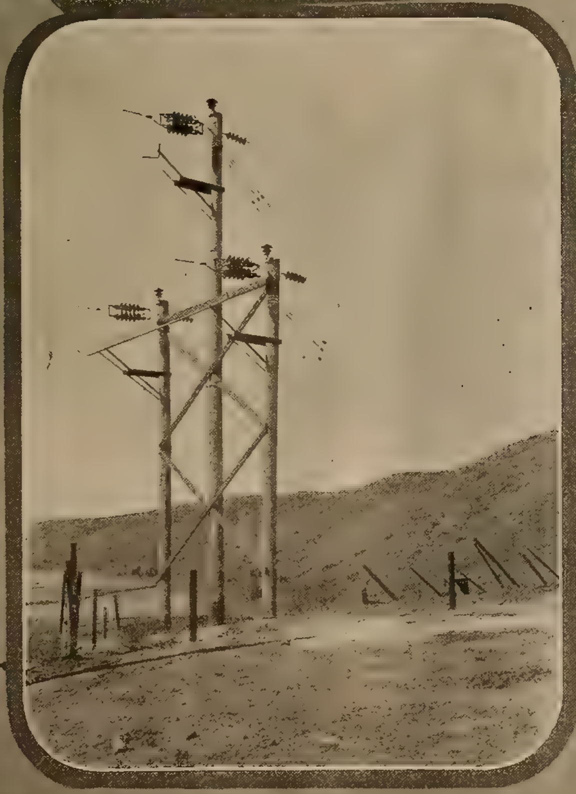


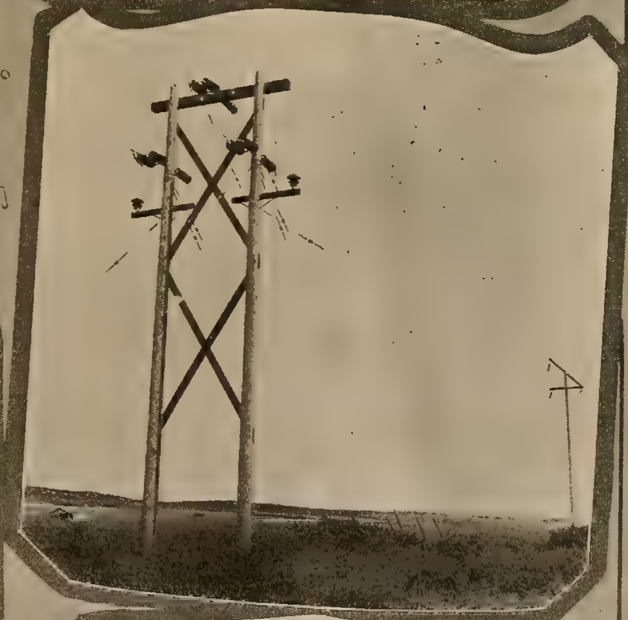
Showing the general layout at the top of a three-pole transmission tower. This construction is used for spans of from 2,500 ft. to 3,500 ft. where adjoining spans are shorter than 1,000 ft. Extra-galvanized, high-strength steel stranded conductors are used for all long spans. All hardware on the structure is solidly bonded together and grounded to prevent burning the top of the poles. The method of clamping the ground wire is shown in the insert above the front view of the structure at the left. The ground wire passes under the pole collar.

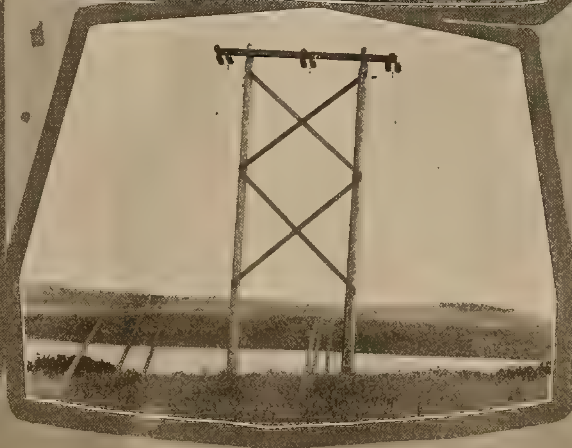
SAN DIEGO 66,000-volt transmission line structures for long spans. The three-pole structure is one of a pair carrying a span of 3,379 ft. Immediately below is shown one of the two-pole towers which carries a span of 2,195 ft. The two-pole support shown below and to the right carries a 2,095-ft. span while typical construction for a 1,680-ft. span is shown in the lower-right corner.











IDEAS FOR THE CONTRACTOR

Display-Case Lighting Potential Field For Contractors

The tremendous possibilities of potential business for electrical contractors in developing show-case lighting is well illustrated by the following extracts taken from a report presented to the Illuminating Engineers Society by C. O. Martin of the Benjamin Electric Manufacturing Company of San Francisco. The investigation was made and the data supplied by the engineering department of the National Lamp Works of the General Electric Company.

The investigation referred to was made in a large department store to determine the relative attracting power of various levels of illumination in show cases. The original equipment in the cases consisted of 25-watt tubular clear Mazda B lamps located in trough reflectors which were spaced on approximately 24-in. centers. It was possible to substitute 40-watt tubular clear lamps instead of the 25-watt lamps so that three levels of illumination were available for the investigation: (1) eleven 40-watt lamps in the trough reflectors from which an average of 20 foot-candles was obtained upon the display; (2) eleven 25-watt lamps in the trough reflectors which produced approximately 12 foot-candles on the display; (3) the general overhead lighting system produced about 2½ foot-candles. The displays in the cases were not changed during the investigation.

The investigation was conducted on Thursday and Friday of one week and on Monday and Tuesday of the following week. During the first two days the lighting in the cases obtained from the overhead lighting system only and by means of the 25-watt lamps was changed every hour from nine o'clock a.m. to five o'clock p.m. On the last two days the same hourly changes were made, the lighting being obtained from the overhead system only and the 40-watt lamps. On the second day, the lighting levels were used in a different order than on the first. The order on the third day corresponds to that of the first day while the fourth day's order was identical with that of the second.

The total number of passers-by and the number who stopped to look in the cases were counted for each hourly period. In keeping the talley of the people who stopped to view the cases only those were counted who were attracted to such an extent that they came close to the glass front and reduced their rate of travel to a slow walk while looking in the case or definitely stopped. All individuals were counted except those under five or six years of age who were necessarily accompanied by an older person.

The data obtained is very interesting, and the results are shown in tables Nos. I, II, III. Some conclusions can be drawn from these that are well worth noting.

1. More than three times as many people were attracted to the show cases when they were illuminated to an intensity of approximately twelve foot-candles by using the 25-watt tubular lamps than when they were poorly lighted by the general store-lighting system which produced only 2.5 foot-candles.

2. More than five times as many people were attracted to the show cases when they were illuminated to an intensity of approximately twenty foot-candles by using the 40-watt tubular lamps than when the general store lighting was used.

3. More than 48 per cent more people were attracted to the show cases when they were illuminated to twenty foot-candles than when illuminated to twelve foot-candles.

TABLE NO. I.

		Total Traffic	Attracted by Display Case
	Thursday		
9-10	12 Ft.-can. case ltg.	78	8
10-11	2.5 Ft.-can. case ltg.	147	0
11-12	12 Ft.-can. case ltg.	133	14
12- 1	2.5 Ft.-can. case ltg.	414	21
1- 2	12 Ft.-can. case ltg.	227	30
2- 3	2.5 Ft.-can. case ltg.	200	9
3- 4	12 Ft.-can. case ltg.	170	15
4- 5	2.5 Ft.-can. case ltg.	92	2
	Friday		
9-10	2.5 Ft.-can. case ltg.	62	1
10-11	12 Ft.-can. case ltg.	72	6
11-12	2.5 Ft.-can. case ltg.	170	2
12- 1	12 Ft.-can. case ltg.	482	22
1- 2	2.5 Ft.-can. case ltg.	275	4
2- 3	12 Ft.-can. case ltg.	261	17
3- 4	2.5 Ft.-can. case ltg.	193	3
4- 5	12 Ft.-can. case ltg.	110	11

TABLE NO. II.

		Total Traffic	Attracted by Display Case
	Monday		
9-10	20 Ft.-can. case ltg.	50	8
10-11	2.5 Ft.-can. case ltg.	125	3
11-12	20 Ft.-can. case ltg.	170	24
12- 1	2.5 Ft.-can. case ltg.	464	7
1- 2	20 Ft.-can. case ltg.	291	22
2- 3	2.5 Ft.-can. case ltg.	263	4
3- 4	20 Ft.-can. case ltg.	125	15
4- 5	2.5 Ft.-can. case ltg.	180	4
	Tuesday		
9-10	2.5 Ft.-can. case ltg.	232	1
10-11	20 Ft.-can. case ltg.	137	21
11-12	2.5 Ft.-can. case ltg.	250	2
12- 1	20 Ft.-can. case ltg.	290	32
1- 2	2.5 Ft.-can. case ltg.	402	10
2- 3	20 Ft.-can. case ltg.	154	20
3- 4	2.5 Ft.-can. case ltg.	139	2
4- 5	20 Ft.-can. case ltg.	81	11

TABLE No. III.
Results.

	(1) Sum Total of Traffic Past Cases	(2) Attracted by Display Cases	(3) Percentage Traffic Stopped	(4) Relative Attractiveness (Based on Col. 3)
2.5 Foot-candles Case Lighting........	1804	38	2.1	1.0
12 Foot-candles Case Lighting........	1533	123	8.0	3.8
20 Foot-candles Case Lighting........	1298	153	11.8	5.6

Opening Bids In Public Urged for All Contractors

[Editor's Note:—The following clipping was recently received from E. Earl Browne, manager, San Francisco Association of Electrical Contractors and Dealers.]

Let us go on the question of opening bids in public. If we can put this across we will have taken a long step towards eliminating the greatest temptation that confronts the owner, the architect and the general contractor, to violate the ethics of our profession.

It will force the owner and the architect to select a comparable list of firms when compiling their list of bidders. It will eliminate the old game of playing one contractor against the other to force a lower figure. We all know what our costs are and should be willing to stand by our first proposition. We are not fair to ourselves or our fellow-members when we become party to shopping after bids are opened. We enter into the competition with the idea of winning. It costs us from $100 to $1,000 or more to figure a set of plans and our competitors a like figure. Assuming there are ten bidders, that means from $1,000 to $10,000 has been spent to get the job.

Is it fair that one firm should have any "inside" on another, all things being equal? Certainly after spending the time and money to prepare a bid we are entitled to know where we stood. If an owner or architect wants a certain firm to get a job, let him give it to them on a fee basis or any other basis that is mutually agreeable, but once a job is put out for competitive figures, let us insist on public opening.

Competitive bidding implies fair play for all. Let us make it so by opening bids in public. We can do this if we stand together by taking the stand that we will not figure plans unless they are opened in public.

If we do this we cannot help but win. —(K. P. Lowell in the August News Letter of the Southern California Chapter, Associated General Contractors.)

Service Conduit Is Increased in Entire Tract of Homes.—The Tracy Electric Company, San Francisco, is installing the wiring in a tract of 200 moderately priced homes which are being built in the Parkside District in that city by the Lang Realty Company, agent and builder. Through the efforts of Frank J. Keifer, field representative of the California Electrical Bureau, the service conduit has been increased from ¾-in. to 1¼-in. in order to allow the use of electric ranges and water heaters.

The Ashton Electric Company recently moved into a new store at 15 North Garfield Avenue, Alhambra, Calif. They were formerly at 7515 Sunset Boulevard, Los Angeles. The store is operated by R. C. Ashton.

Contractors Interested in Electrical Safety Orders

Progress on Regulations for Electrical Installations Under the California Industrial Accident Commission

BY G. E. KIMBALL
Engineer, California Industrial Accident Commission

The electrical industry is as interested in the completion of the Electrical Safety Orders as the employer of labor in whose place of employment they will be effective. It should be of vital interest to everyone in the industry to keep the number of accidents down to the lowest possible figure in order that the enviable record of being the "safest possible power" may be maintained. "The Universal power" must be made as nearly 100 per cent safe as is possible, and this task is in a large measure directly up to the industry itself. Every person who uses electrical energy in any form whatever also is interested vitally in having reasonable and practicable safeguards provided. Rules and orders regulating electrical wiring and installations are necessary and must be enforced if the desired results are to be obtained.

The Electrical Utilization Safety Orders of the Industrial Accident Commission when first introduced unquestionably revolutionized wiring and installation methods in California. In 1917, when they first became effective, open knife switches and open wiring were the common standard in practically all industrial power and lighting installations. In the few years that these orders have been effective, they have brought about many changes in electrical installations and also in the design and construction of electrical equipment. The electrical industry is moving rapidly forward, however, and the electrical orders of 1917 soon were found to be inadequate for the changed conditions. Therefore they were revised by an advisory electrical committee, and the proposed revised orders were printed and distributed for a practical tryout in the field. Being far in advance of the old electrical orders, voluntarily they were placed almost immediately in use by electrical contractors and wiremen. Some municipalities in the state made them a part of their electrical ordinances, enforcing their requirements on all new installations. This practical tryout assisted the committee in redrafting the orders for the Tentative Electrical Safety Orders, which are being printed now and soon will be distributed for public hearings.

Remarkable as has been the past experience for low electrical accident records, by comparison with accidents from other causes, and considering that electrical energy is used in some form or other in practically all places of employment and in nearly every home, still there are many preventable electrical accidents. Such rightfully may be charged against the electrical industry, indirectly in some cases, but nevertheless the responsibility definitely rests with the industry in the final analysis. The use of electrical energy is potentially hazardous. If improperly designed electrical equipment or devices are used; if wiring and control equipment are not properly installed with the live parts and conductors suitably enclosed and guarded; if the conductors and the non-current-carrying metal parts of the electrical equipment are not grounded adequately and effectively; if the switches and control devices are not marked properly identifying them plainly with the equipment they control; and, most important of all, if the person who is to use or operate the equipment has not been instructed thoroughly and warned of the possible results if electricity is not treated with due consideration and respect, then electrical accidents may be expected with increasing frequency. In other words, practically all electrical accidents are preventable. When one occurs, except in cases which are unquestionably due to carelessness, it is usually possible to blame someone in the electrical industry who was careless or negligent in designing, constructing, or installing the particular equipment or device, or to someone who was careless in the instruction or education of the person who was injured.

The electrical industry is jointly responsible with accident and fire prevention organizations for the installation of safe electrical equipment and the dissemination of proper information regarding its use. Electrical installation rules and orders are effective only when conscientiously and intelligently applied. That such regulations may be applied and enforced effectively requires that the orders be available for the instruction and information of every electrical engineer, contractor, electrical worker, or other person responsible for the installation of electrical equipment. It will be of interest, therefore, to all concerned to know that the Electrical Safety Orders of the Industrial Accident Commission, providing a minimum standard for electrical installations in places of employment in the State of California, will be printed and distributed as effective orders soon after the public hearings on the Tentative Electrical Safety Orders. The dates for these hearings to be held in San Francisco and Los Angeles will be advertised as soon as the tentative orders are received.

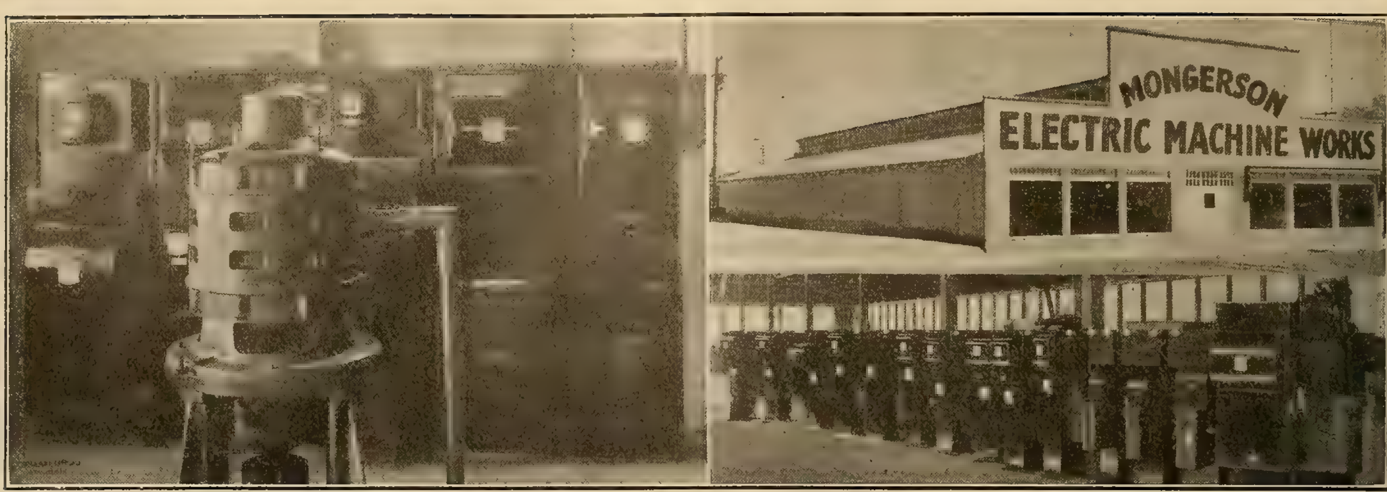
Electragist Makes Suggestion Which Trebles Contract

A splendid example of the possibilities for an electrical contractor in building up a job was recently demonstrated by Victor Lemoge, electragist of San Francisco and president of the California Electragists. He had been given a knob and tube job of wiring on a block of sixteen homes at 5300 Mission Street. Mr. Lemoge suggested to the owner that a greater return on his investment probably could be realized by putting stores on the first floor of the buildings. The owner was sold on the idea, which resulted in a conduit installation instead of knob and tube as orginally specified, and the wiring amounted to approximately three times what it would have been.

The value of the suggestion has been proved by the fact that eleven of the sixteen stores have been sold, although the buildings are still under construction. Contractors may profit by the example of Mr. Lemoge by making timely suggestions to the owners which will benefit the owners and at the same time considerably increase the amount of their contracts.

Burlingame Adopts Electrical Rules in Effect in Oakland.—The City of Burlingame, Calif., has adopted the electrical rules now in effect in Oakland in their entirety, with the additional provision that conduit service be required in all installations. The new rules are to become effective April 15, 1925. Previous to this time, the city has had no electrical ordinance. It is thought this will be an aid to all electrical contractors and will extend the territory in which the Oakland rules will be effective. The rules of Oakland are considered to be among the best in the state.

This picture shows a motor-driven pump installation in one of the rural districts. After a rain anyone touching the wall will receive a shock. The wires leading to the pump house were carelessly installed so that they touched the ridge of the roof, and the insulation has been worn off by the action of the wind. This is an example of the hazards created by improper electrical installations which are made in many rural districts, and points to the need of inspection service in these districts.



The new plant of the Mongerson Electrical Machine Works at Bakersfield, and a group of Mongerson panel boards ready for the shipping room. The picture on the left shows one unit of the municipal water plant at Delano, Calif., which has a Mongerson panel board.

Panel Switchboard Manufactured in Modern Plant

One of the most completely equipped electrical manufacturing plants in central California is the Mongerson Electrical Machine Works, located at 2328 Chester Avenue, Bakersfield. The company manufactures a self-contained panel switchboard for pumping plants, and other panel boards and equipment.

The new plant covers more than 11,000 sq. ft. of floor space. Most of the machinery for crimping, welding, punching and shaping the sheet steel has been manufactured by them as there was none on the market to serve the purpose. The welding as well as practically all of the other operations is done by electricity. At the present time from sixteen to eighteen men are employed in the manufacturing department, who are capable of manufacturing twenty-five complete panel boards daily.

The Mongerson panel board is very compact and offers a cabinet board which is simple, economical and safe. It is built up of safety switches and starting equipment of the highest grade. The starter and compensator of any manufacturer will be used by the factory upon order, or they may be sent to the factory to be mounted. Standard boards are made up using Westinghouse, General Electric, and Fairbanks-Morse starters and compensators, with Square D switches.

The history of the organization has been one of steady growth. Twelve years ago W. R. Mongerson opened an electric shop in Bakersfield for the sole purpose of rewinding motors, generators and transformers. A new field of operation was opened when the oil operators began to discontinue the use of gas and steam engines and installed electric motors. Work came from all parts of the Southwest, especially from Nevada, Arizona, and southern California.

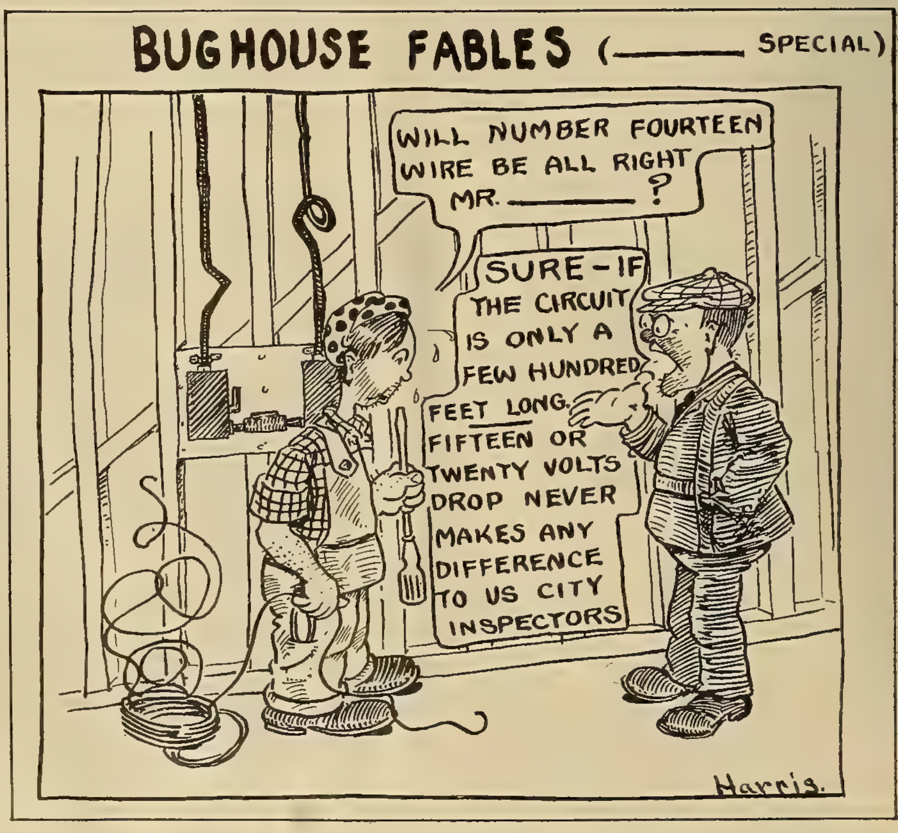
Realizing the need for a substantial, inexpensive panel board on which could be mounted all the apparatus for the electric control of pump equipment, Mr. Mongerson began to perfect one to serve the purpose and in 1923 introduced the first Mongerson panel board. Since that time the company has developed along manufacturing lines.

The distribution policy of this company has been designed to protect the contractor-dealer, and it is intended that the device shall be sold through that channel. Pump manufacturers and contractors have been quick to adopt this panel board and it has been a great help in building up the standard of these installations.

Electrical Men Should Explain Code to Builders

Prior to the passage of the new electrical ordinance in Oakland, a certain building contractor was having three circuits and two convenience outlets installed in each house built by him. The new rules required three convenience outlets to be installed in every house. He went to the city electrical department to complain of the injustice of this requirement. The new ordinance was explained to him, and he was shown that the lighting outlets could be placed on two circuits and the convenience outlets on one circuit, and that the only additional cost to him would be the cost of No. 12 wire instead of No. 14 for this one circuit and the cost of the one additional convenience outlet. When he found it would not require an additional circuit to accomplish this and that the additional expense would not be heavy, he was sold on the idea, and now installs five convenience outlets in each home instead of two as before.

Benson and Prine Electric Company have recently opened a new store at 6611 Washington Boulevard, Culver City, Calif. J. T. Benson was formerly a contractor-dealer of La Habra, Calif., and Forrest Prine was construction foreman of Jervis Electric Company of Culver City.



The ideal electrical inspector as interpreted by a journeyman electrician

An Open Letter to Electrical Contractor in Business

To the Members:

Price talks. If you don't go low enough, nobody can hear you. To go low means that you leave out all that is possible, and then substitute cheap stuff for the material you have put in. That's the only way to get business.

And yet, I wonder why merchants who sell their stuff to these same people you call your customers don't have to use the same methods. Take automobiles, for instance—a luxury—in the class with electric heaters, water heaters, ranges, appliance outlets, something which can be eliminated, not necessary, costs you money to own and operate. And still, your customers don't even buy the cheapest type of automobile, admitting that their one great aim in life is to get by at the lowest possible expense. Your customer has a good car; it's only the electrical contractor, with no overhead, who has to use a cheap car.

The General Motors Corporation did a fair business last year—562,553 passenger cars—and sold every one at better than the lowest possible price. And see how the closed-car business has grown:

In 1922 only 28 per cent of the total were closed cars.

In 1923 37 per cent of the total were closed cars, and in 1924 43 per cent of the total were closed cars.

Which shows that the public is not looking for the cheapest article, but is willing to pay 100, 500 or 1,000 per cent more than the lowest price, where it believes it is getting its money's worth.

That "closed car" electrical comfort in the home is not increasing at the above rate cannot be explained away by saying that the public wants to get by too cheap, because our public is the same public to whom the automobile man sells his high-priced goods. The contractor has not been able to convince the public of the value of the complete job because he doesn't know how, or hasn't tried, and also because the industry talks too much about the electrical convenience in trade names, material brands, pedigree of the manufacturer and so on, and not enough in terms which will convince the public that the electrical convenience is after all for their convenience.

LAURENCE R. CHILCOTE,
Secretary-Manager, Electrical Contractors and Dealers Association of Alameda County, Oakland, Calif.

Poor Electrical Connections Are a Public Menace

The two pieces of wire shown in the accompanying picture were part of the electrical wiring in a home which was recently destroyed by fire in San Francisco. The fire was not caused by the wiring, although it might have been if a small arc had occurred in either of these unusually poor connections. The wiring in this home evidently had been done by the owner and had not been inspected. The general public is usually not aware of the danger of poor electrical connections in a single wire, believing that the danger lies in a direct short between two wires. However, a direct short will blow the fuse, while an arc in a single wire may not be sufficient to blow a fuse, but it may ignite the surrounding material. Properly made joints which are soldered are essential to a safe electrical installation.

Contract Increased 65 Per Cent by Electrical Bureau

Through the work of LeRoy H. Crandall, field representative of the California Electrical Bureau, the electrical contract for the new store of the Richardson Furniture Company of Chico, Calif., was increased about 65 per cent. Mr. Crandall first discussed the job with the Boblet Electric & Manufacturing Company, who had been awarded the work, and together they called on Mr. Richardson. By their joint efforts they were able to have the window lights placed on 15-in. centers instead of 30-in. centers as originally specified. Mr. Richardson was sold the idea of installing the name of the company in the marquise so it could be illuminated; also of placing two floodlights on top of the marquise to floodlight the front of the building.

In order to prevent the sunlight or artificial illumination fading the rugs, Mr. Richardson is having a rug loft installed very similar to a theater curtain loft. Fifteen 150-w. daylight lamps with solid back reflectors are installed that will illuminate to an intensity of approximately 7 foot-candles any rug which is lowered from the loft. By this novel method the danger of fading is eliminated, and the rugs can be shown to prospective customers under adequate illumination.

Block of houses wired with rigid conduit upon suggestion of contractor.

Changes Made in the National Electrical Safety Code

The next edition of the National Electrical Safety Code will embody several additions and changes as a result of the meeting of the sectional committee which was recently held at the Bureau of Standards. Rules for the construction of radio antennas will be included, grounded returns on power circuits in cities will be prohibited, and the loading map will be changed to permit lighter line construction in Montana and the greater part of Wyoming.

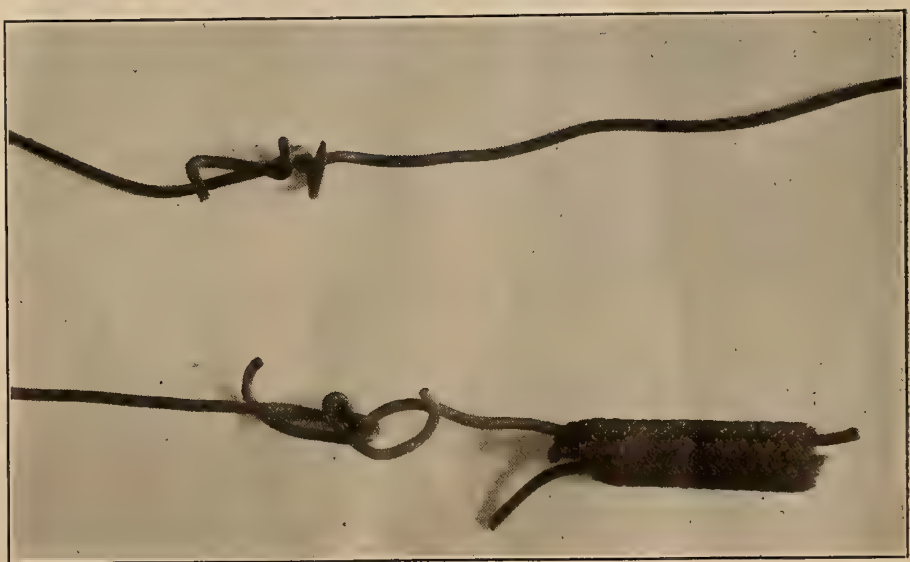
This code is under the jurisdiction of the American Engineering Standards Committee, and is revised at intervals of a few years so as to keep its provisions in accordance with the most modern practice. The present revisions have been under consideration for the past two years.

The use of the ground as a normal return for power circuits in cities is forbidden, and the committee recommended against this practice in rural districts. It has been found that serious damage to pipes and other buried metal structures through electrolysis has been caused by large currents flowing through the earth.

Some changes have been made in the recommendation for the joint use of poles by power, telephone or telegraph companies. A new table of flashover values for insulators has been prepared. A distinction has been made between conflicts of pole lines and conductor conflicts. The clearances required between crossarms have been applied to conductors in bow-and-arrow or wishbone construction. More liberal provisions have been made for the use of buck arms. Changes have been made in the wire sags and the head guys for signal line construction to agree with the specifications of the American Railway Association. Changes also have been made in the loading specifications upon which the strength requirements of poles, towers and conductors are based, and in the factors of safety for wood poles. A table of working stresses for steel used in supporting structures has been established.

Evidence has been obtained to show that the loading requirements in Montana and Wyoming are not as rigid as formerly had been supposed. This is due to the fact that they are not as subject to excessive ice loads.

Orland Electric Shop, Orland, recently has joined the California Electragists.



Two pieces of wire taken from a home following a recent San Francisco fire. The hazardous installation is plainly shown.

NEWS OF THE INDUSTRY

Renewal of Denver Utility's Franchise to Be Submitted to Voters in May

The question of the renewal of the Denver gas and electric twenty-year franchise of the Public Service Company of Colorado will be submitted to the voters at the municipal election to be held May 19. The present franchise will not expire until June, 1926, but it is planned to submit the matter at the coming election in order to avoid the expense of a special one later.

A comparison of the proposed franchise with the present one reveals the following changes:

The residential electric light rate is reduced from 10 cents per kw-hr. to 8 cents, with minimum monthly bill of $1 as before; the rate for lighting on the readiness-to-serve basis remains the same, $9 per year per meter plus 5 cents per kw-hr. for current furnished, except that instead of $1.80 a year for each 50 watts connected $1.80 is to be charged for each 16-cp. lamp connected; power on meter basis remains the same, 4 cents per kw-hr., with minimum of $1 per month per horsepower connected, except minimum of $2.50 per month per meter will be charged instead of $3; power on readiness-to-serve basis on yearly contract for service, will remain $9 per year per meter, but the yearly charge per horsepower of demand will be $18 instead of $24, and 2½ cents per kw-hr. will be charged for current furnished instead of 3 cents per kw-hr. The gas rate on meter basis is reduced from $1.10 per 1,000 cu. ft. to $1 per 1,000 cu. ft., with minimum monthly bill of 25 cents. The readiness-to-serve rate remains the same, not exceeding $9 per year per consumer plus $3 per 10 cu. ft. of maximum hourly demand, plus 70 cents per 1,000 cu. ft. for gas consumed. Both electric and gas bills are subject to a 10 per cent discount for cash in 10 days.

Other provisions of the franchise include: payment of a $1,000,000 franchise tax at the rate of $12,500 quarterly during the life of the contract, as also provided in the existing franchise; pledge by the company to grant to the city as favorable a street lighting contract as the present one for a term of 10 years and to renew the contract for a 10-year period if desired; payment by the company to the city treasury of all amounts collected in excess of an average of 75 cents per 1,000 cu. ft. for gas and 6 cents per kw-hr. for electricity, which is also a provision of the present franchise; requirement that the company extend its electric lines 125 ft. to serve a new customer instead of 100 ft., as required by the franchise now in effect.

A provision in the proposed franchise designed to protect the company against fluctuation in living costs reads:

It is hereby mutually contracted and agreed that said rates and charges and said averages shall vary with the United States government annual index number of wholesale commodity prices, now collected, computed and published by the United States Department of Labor, as follows:

For each full fifteen units increase or decrease from 150 units, which is the approximate index number for the year 1924, and which said 150 units is hereby adopted as a base or standard, there shall be a corresponding change of 5 per centum increase or decrease in all the said rates and charges, provided in section 5 hereof (fixing gas and electric rates) and the said averages, provided in section 6 (relative to collections in excess of figures previously mentioned). Provided that for the remainder of the year 1925 and until April 1, 1926, by which time the said annual index number for the preceding calendar year will have been collected, computed and published, there shall be no change in the said rates and charges and averages. After April 1, in 1926, and in each succeeding year, the said annual index number of the calendar year next preceding shall govern, determine and fix, as provided in this section, the said rates and charges and averages for twelve months from and after each such April first.

The tentative franchise states that for the rates, charges and averages provided the company must maintain its present standards of gas and electric service, and that if the company be "required by proper authority to change such standards or the facilities with which the company supplies such service, the company may make changes in the said rates and charges and averages so as to reflect the cost of any such changes in standards or facilities."

Opposition to the renewal franchise in Denver has been voiced by a number of civic organizations, including a special committee appointed by the Chamber of Commerce, the Allied Improvement Societies, and several minor organizations, all claiming that sufficient time has not been permitted by the company for a careful and thorough study of the franchise provisions before acceptance by the city council for presentation to the voters at the regular election May 19.

In reply officials of the company explain that the matter of renewal is one to be decided by the tax-paying electors of the city and on the merits of the franchise as prepared and submitted by the company, the measure, therefore, not being subject to consultation with various groups, unofficial and otherwise. According to Clare N. Stannard, vice-president and general manager of the Public Service Company, the franchise will be submitted for decision at the coming election even in face of the repeated allegations that sufficient time has not been presented for an investigation.

Although less than 4,000 signatures are required to initiate the franchise renewal for placing on the ballot, over 35,000 names were secured by representatives of the company, and an active educational program is being carried on. The new franchise has been introduced in the city council and passed on for final reading. All that remains is for the necessary amount of legal advertising to be done in local newspapers, outlining provisions of the new franchise.

The city council has retained the engineering firm of Wood & Weber to make an appraisal of the company's holdings and to advise on the proposed franchise.

Agency Plan Adopted for Disposal of Hetch Hetchy Power

The adoption of an agency plan for the temporary disposal of power from Hetch Hetchy, San Francisco's hydroelectric power project, was approved unanimously by the Board of Supervisors of that city at a meeting April 13. A special committee has been appointed to negotiate with the local power companies to distribute the energy. The city engineer had been *informally* offered approximately $2,000,000 a year for the power by the private corporations, according to report.

The question of power disposal has been brought to an issue at this time because in about sixty days power from the 80,000-kw. Moccasin plant will be available at Newark, about thirty miles from San Francisco, for distribution by the latter city. As the Raker Act, which granted the Hetch Hetchy water rights to San Francisco, provides that the power generated by the plant cannot be sold to any private corporation for resale, an advisory committee had recommended to the supervisors at a meeting prior to April 13 that some plan be agreed upon whereby the city might lease facilities from one of the local power companies on a flat rate basis and sell power to the city's own consumers. This plan, which the advisory committee proposed as the only feasible solution to San Francisco's power-disposal problem until such time as the city shall have acquired a municipal distribution system or decided what ultimately shall be done with the power, is the one just approved by the supervisors. It includes a provision to the effect that any agreement entered into for the distribution of the power must conform to the provisions of the Raker Act.

New Building for Burned Transformer Plant Being Erected Rapidly.—Work is progressing rapidly on the new steel and brick factory building for the Gardner Electric & Manufacturing Company, Emeryville, Calif. This is being erected on the site of the buildings destroyed by fire early in February and will be a modern Austin-type building. When completed this will be one of the finest transformer manufacturing and repair plants in the West.

Death Ends Brilliant Career of James A. Lighthipe

James A. Lighthipe, chief electrical engineer of the Southern California Edison Company, a pioneer in electrical engineering and a specialist in transmission-line engineering, died in Los Angeles April 10 following a long illness. His career has been a brilliant one, and his contributions to electrical engineering have had a marked effect on hydroelectric development in the West.

Mr. Lighthipe was born in Orange, N. J. He received a course of training in the Edison laboratories at Menlo Park and was one of the few men present when the first successful incandescent lamp was produced in 1879. During that period he worked very close to Thomas A. Edison and assisted him in the solution of many of the problems connected with his early contributions to the industry. Soon afterward, Mr. Lighthipe went abroad where he spent five years connected with the development of the electrical industry on the continent. In London he was employed by the Edison Telephone Company in the installation of the telephone system there. Later he spent two years building the telephone system in Belgium, after which he returned to London and was associated with the British Insulite Company. When the Edison company started a factory near Paris, Mr. Lighthipe went to France and assisted in the construction of the first Jumbo generator for the Milan company in Italy. He then spent a year in Berlin installing Edison plants.

JAMES A. LIGHTHIPE

In 1884 he returned to America where he engaged in the installation of Brush arc-lighting sets in Trenton, Philadelphia and Wilmington. He first came West to act as the superintendent of construction for the Edison Consolidated Electric Company. It was in this connection that his important engineering contributions were made, first on the construction of the Folsom-Sacramento transmission line, which was the beginning of polyphase generation and transmission, and later on the construction of the three-phase line from Santa Ana River to Los Angeles. This latter line, which was built by the Southern California Power Company, was the first 33,000-volt line ever to be operated.

In 1908 he became associated with the Southern California Edison Company as chief electrical engineer, a position he held until his death. He played a prominent part in the working out of the hydroelectric development program of that company. For the past five years he has devoted most of his attention to experimental research on problems connected with the engineering phase of the industry, but at the same time gave freely of his counsel and advice on matters having to do with the electrical construction features of the company's projects.

Mr. Lighthipe was a fellow in the American Institute of Electrical Engineers and was vice-president of the organization for two years. He was a close personal friend of the late Dr. Steinmetz.

During his brilliant career he has been a close student of electrical affairs, a leader in electrical progress and pillar in the organizations with which he has been connected. He was intensely human, patient, appreciative of the shortcomings of his fellow men, quick to foster ambition and initiative in his subordinates, and beloved by his associates.

Electrical Industry Voices Regret at Death of J. A. Lighthipe

The passing of James A. Lighthipe, one of the foremost pioneers in electrical engineering, prominently identified with electrical development on the Pacific Coast, and at the time of his death chief electrical engineer of the Southern California Edison Company, has brought forth expressions of sorrow and appreciation from many of the men who were associated with him in the early days of electrical pioneering.

Harris J. Ryan, past president of the American Institute of Electrical Engineers, and professor of electrical engineering at Stanford University, Palo Alto, Calif., says:

"James Lighthipe's death grips the attention of the electrical engineers of our country in deep sorrow and in highest appreciation of his life devoted to the sciences and their application in sound economic engineering. He helped all who knew him. In them and their successors his spirit will live always."

O. B. Coldwell, vice-president in charge of construction and operation, Portland Electric Power Company, Portland, pays this tribute:

"During the many years Jim Lighthipe was Pacific Coast engineer of the Edison Consolidated Electric Company there was no better known nor more active engineer along the entire Coast. He brought with him when he came West a wealth of experience dating back to the earliest Edison laboratory days, and his counsel and advice were much sought after and always freely and generously given. He will be greatly missed by the old-timers of the electrical fraternity."

P. M. Downing, vice-president in charge of construction and operation, Pacific Gas and Electric Company, San Francisco, expresses his sentiments in these words:

"With the passing of James A. Lighthipe the electrical industry has lost one of its most popular and best beloved representatives. Coming to California during the early days of the industry, he was actively and prominently identified from the very inception with practically every electrical development that has taken place in the state. His brilliant mind, his robust physique, together with his genial good nature and his ever ready and unselfish willingness to assist others in working out their problems, made for him a world of friends in every walk of life, all of whom mourn his untimely death."

Work Is Started on Increasing Lake Almanor Capacity

Work on raising the Big Meadows Dam of the Great Western Power Company of California on the Feather River has been started. Forty-five feet will be added to the present 80-ft. hydraulic earth-filled dam impounding Lake Almanor, thereby raising the storage capacity of the reservoir from 300,000 acre-ft. to 1,300,000 acre-ft. When the work is completed it is said that Lake Almanor will have a storage capacity in excess of all other California reservoirs combined. The undertaking will flood an additional 13,500 acres of land in what was formerly the Big Meadows in Plumas County, about 190 miles northeast of San Francisco. The present reservoirs flood 15,500 acres.

The present dam built in 1913 is 600 ft. long, and the raised dam will be 1,250 ft. long and will contain 1,500,000 cu. yd. of material. The dam is at El. 4,450, and the water will be used several times in the 4,000-ft. drop between Big Meadows and Oroville, 75 miles down the stream. The watershed of Lake Almanor is 504 sq. mi. and in addition to the surface runoff is fed by many large springs.

Construction of the addition to the Big Meadows Dam is planned to be completed to store water beyond Lake Almanor's present capacity during the winter of 1926-27. The project, of which the dam-raising is the major part, will cost about $2,000,000.

Northwestern Electric Company Takes Larger Quarters

Because of the crowded condition of the offices of the Northwestern Electric Company, Portland, brought about by the growth of the company in recent years, new general offices on the second floor of the Pittock Block were occupied recently. The new offices utilize 9,000 sq. ft. of area in the southwest corner of the building and front 120 ft. on Washington Street. The center of this space is left open in front of a counter, while around the edge of this open space are ground glass partitions marking off the offices of the various departments.

Contact with the public is facilitated by means of an information desk situated outside the counter by the main entrance from the building hall. The appliance store and pay station on the ground floor of the building on the corner of Tenth and Washington Streets will be continued in that location as formerly.

Edison Company Has Record Peak Load.—The Southern California Edison Company, Los Angeles, recently had a peakload of 335,800 kw., which was the record peak for the system up to that time and came at the usual low period of the year. A substantial irrigation load just before the last rains was somewhat responsible for the high peak, which is 10,000 kw. greater than the amount predicted two years ago. It is estimated that the summer peak this year will reach 350,000 kw. Precipitation in the Big Creek territory this year continues to be above the average, and the company expects to carry most of its load with hydraulic power, using only the new units at Long Beach steam plant No. 2 for block steam power.

Rocky Mountain Electrical League Holds Fourth Annual Convention

Attended by a large and representative gathering of members of the electrical industry of Salt Lake City and nearby territory, the Rocky Mountain Electrical Cooperative League held its fourth annual convention in Salt Lake City on April 4.

The afternoon session, which opened at the Hotel Utah, was devoted to a program which included interesting talks by local men prominently identified with the industry, and a general discussion of business conditions by E. O. Howard, vice-president of Walker Brothers, bankers, of Salt Lake City. This session was presided over by G. R. Randall, vice-president of the league, and manager of the Salt Lake Electric Supply Company.

C. B. Hawley, president of the League, and manager of the Inter-Mountain Electric Company, welcomed those in attendance with a brief talk in which he stated that he was proud of the accomplishments of the men in the local electrical field and of the work of the league. He complimented the Utah Power & Light Company on the remarkable results obtained by its organization in the washing-machine campaign just concluded. He stated that it is up to the men of the electrical industry to face new problems which are presented from day to day and to solve them in such way as to maintain the present high standards.

E. L. Bourne, manager of the advertising department of the Utah Power & Light Company, discussed the subject "Talking in Type." Mr. Bourne introduced his subject by stating that advertising in the electrical field can and should be brought up to the point where it is continually producing bigger and better results. "Advertising alone, however," he said, "will not do the job. Much real work also must be done." He spoke of the intensive efforts being put forth and the large amount of money being spent by utilities throughout the country in building good will, and stated that such efforts are accomplishing much in the way of favorable results. He pointed out the importance of advertising as linked with success in business, and stressed the fact that it must of necessity be a continuous process rather than a spasmodic effort. He advised against extravagance in advertising, and spoke of the enormous waste that is brought about in the spending of large sums of money for ineffective advertising in some lines of business. Truth in advertising also was discussed by the speaker as one of the real fundamentals.

E. O. Howard was the next speaker. Mr. Howard discussed business conditions of today, and pointed out several examples of business romance, mentioning several large business institutions of nation-wide scope and prominence which a few years ago were almost unknown.

In speaking of the electrical industry, he said:

"The electrical industry is today largely the barometer of trade. There is no industry that enters into every phase of our life as electricity does. It seems to me that electricity, in all of its different forms, has really passed that of the steel industry in its importance —the importance of the position it occupies. You men have a great responsibility in maintaining the high character of the business in which you are engaged, and that is especially true, it seems to me, in the installation of electrical work, where the responsibility of the contractor is very great as to whether the job is done safely as well as economically."

Referring to local conditions, he stated that fundamentally business is sound, just as it is throughout the entire country, with industrial conditions, especially mining, in excellent shape. He commended the Utah Power & Light Company for its policy of purchasing a large part of its operating and construction materials and supplies through local channels.

He commended the men of the public utility industry of today whose vision, courage and foresight a few years ago has made possible the growth and development of these institutions and the consequent advancement of the territory in which they operate.

Fred D. Winegar, city electrician of Salt Lake City, covered the subject "Electrical Inspection, Past, Present and Future." Mr. Winegar compared electrical wiring methods in Salt Lake City of thirty years ago with those of today, and pointed out the different steps of advancement and improvement in such methods. He stated that in making city ordinances for electrical work many things have to be taken into consideration, and experiments made in the way of trying out some of the laws. Mr. Winegar commented favorably on the tendency to standardize electrical equipment at the present time, and recommended that more of this be done. He stated that there is a large market for small appliances in the home, but that heretofore complicated wiring has to some extent retarded their sale and use. He strongly recommended the installation of more convenience outlets, and emphasized the fact that it is largely up to the men of the electrical industry to see that more of these are installed.

The afternoon session was concluded with the showing of a motion picture film furnished by the General Electric Company entitled "The Wizardry of Wireless," in which the development of the telephone and radio was portrayed in an interesting manner.

An evening banquet was held at the Hotel Utah and was attended by nearly 200 guests. C. B. Hawley acted as toastmaster. Features of this session were a three-act comedy entitled "The Disaster of Darkness," staged by the local Lighting Service Bureau, and an illustrated lecture by Lafayette Hanchett, president of the Utah Power & Light Company, entitled "Some High Lights in Mediterranean Travel."

The three-act playlet portrayed two partners in the clothing business, of the "Potash and Perlmutter" type, who were finally convinced of the value of good lighting in their business. The story covered their situation before the proper lighting was installed and then pointed out the contrast and improvement after the Lighting Service Bureau did its work with them.

In Mr. Hanchett's lecture he covered a portion of his trip of a few years ago around the world, describing in an exceedingly interesting manner many of the historic places along the Mediterranean and exhibiting a remarkably fine collection of pictures which he had taken on the trip.

The fourth annual convention of the Rocky Mountain Electrical Cooperative League was marked by good attendance, interesting and instructive discussions and exchange of valuable ideas, which made it the best in the history of the industry in the Intermountain section.

Rocky Mountain Electrical Cooperative League banquet held April 4.

Ninety-six Per Cent of Colorado Utility's Employees are Stockholders. —The Southern Colorado Power Company, Pueblo, recently completed a three weeks' campaign among its employees for the sale of its seven per cent preferred stock, with the result that 96 per cent of the personnel bought a total of 356 shares. Teams of employees from each division of the company participated; on account of the larger number in the Pueblo division, each department had a separate team. E. F. Stone, assistant general manager, had charge of the entire campaign. At its close a new campaign was started for the purpose of securing a still wider distribution of the company's stock among its customers.

Lewiston, Idaho, Receives Proposals for Power and Sawmill Projects

Erection of a 10,000-kw. hydroelectric plant and a sawmill with a yearly output of 200,000,000 ft. at Lewiston, Idaho, is contemplated in agreements recently completed between the Inland Power & Light Company, Portland, and the Clearwater Timber Company of Potlatch, Idaho. The developments would be on the Clearwater River about four miles above the confluence of the Clearwater with the Snake River.

The companies have made a joint proposal to the city of Lewiston, through E. C. Braddock, mayor, whereby the power company agrees to construct at once a dam and power house, and the timber company agrees to build a sawmill, provided that the city secure for them at a reasonable figure the necessary lands and rights-of-way, and withdraw its application to the Federal Power Commission for a permit to develop power on the Clearwater River.

In the joint proposal as presented to the city by the two companies, it is stated that the plans for the project will follow substantially the plans prepared for the city by Stevens & Koon, consulting engineers, Portland, in which a dam would divert water into a forebay flooding about 300 acres, with the power house located on the lower side of the dike sustaining the forebay. The proposal calls for a 10,000-kw. power plant and a sawmill having a capacity of 200,000,000 ft. of lumber per year. As part of the agreement between the companies the forebay is to be used as a log-storage pond. Part of the property involved lies within the city limits of Lewiston.

The city of Lewiston has been anxious to induce the Weyerhaeuser interests to locate a lumber mill there, and in an attempt to secure this industry contemplated furnishing the log pond. It then saw the possibility of generating power by the water thus raised and stored, and to enable it to carry out this project it had applied to the Federal Power Comission for permission to dam the river and develop power, and secured the passage of a law at the last session of the Idaho legislature permitting it to go into the power business. A special election to pass on a $1,500,000 bond issue to carry out the project was set tentatively for May 6, though, since the adjournment of the legislature, a question was raised as to the legality of using the pond for log storage because such use was not mentioned in the enabling act. The present proposal by the two companies clears the situation in that it secures for Lewiston the lumber mill, as well as relieves the city of the necessity of going into a doubtful municipal venture. At the April 6 council meeting, the first after the receipt of the proposal, the council decided to defer for one week action on the ordinance providing for the special election.

The Clearwater Timber Company is a Weyerhaeuser company. The Inland Power & Light Company is affiliated with the Pacific Power & Light Company, owning certain properties operated by the latter company, among which is the newly purchased Washington-Idaho Water, Light & Power Company, Lewiston. (Journal of Electricity, Feb. 15, 1925, p. 150.)

California Adopts Six-State Pact with Reservations

Approval of six-state ratification of the Colorado River Compact was given by the California senate on April 2. The resolution adopted by the California body is practically the same as that sponsored by Colorado (Journal of Electricity, April 1, 1925, p. 258) and signed by Colorado, Utah, New Mexico and Wyoming, except that the ratification of the six-state agreement is made contingent upon the erection by the United States government of a storage dam at or near Boulder Canyon. The resolution was passed by the California assembly before transmittal to the senate.

The ratification by California of the six-state compact with the reservations that have been made overturns the ratification of the original compact two years ago, in the opinion of those familiar with the subject, and came in the face of protests from Herbert Hoover, Secretary of Commerce, and a representative of the Federal government in the matter of the Colorado River disposition. It is believed that the California reservations will form another obstacle to the immediate settlement of the development and use of the Colorado.

Radio Show to Be Held in Washington City.—The Cowlitz County Radio Club of Longview, Wash., will sponsor a radio show in that city in March.

Water-Supply Development Bonds Voted by Aberdeen

At its recent election, the city of Aberdeen, Wash., voted bonds to the sum of $700,000 for the purpose of building a pipe line from the Wishkah River water supply to the canyon of the Wynooche River, a proposed extension of the present city water-supply system. The victory of the bond issue for a water system is expected to be followed very shortly by the submission by the council of a proposal to build a power project on the Wynooche River, in pursuance of the city's fight to obtain and develop power rights on the Wynooche. The bond issue for the power project probably will be in the neighborhood of $1,300,000, which with the $700,000 recently voted, will total the $2,000,000 which it was estimated in 1923 the Wynooche project would cost.

The supervisor of hydraulics at Olympia, Wash., granted the city of Aberdeen until April 10 in which to submit briefs in support of its contentions to Wynooche River power rights. This period also has been extended to the Grays Harbor Railway & Light Company, which is fighting the city for the Wynooche power rights. The extension of time was granted after an all-day hearing on the application of the city of Aberdeen, as assignee of the J. E. Malinowski power permits on the Wynooche River, for extension of that permit. (Journal of Electricity, March 15, 1925, p. 223.)

The Grays Harbor Railway & Light Company also has filed an application for hydroelectric rights on the stream but recognizes the superior right of the city to appropriate water from the Wynooche River for a municipal supply. The Polson and the Simpson logging companies have intervened as opposed to any immediate development on the grounds that such development would be detrimental to timber interests because the flooding of the storage basin would necessitate early and unprofitable logging operations on both the Wynooche and Wishkah River bottoms. The Polson company is more opposed to the flooding than is the Simpson company.

Both the city and the utility company plan to erect a large hydroelectric plant on the stream. The city was prevented from proceeding with development at one time because a bond issue voted for the purpose was held void by the courts. The contestants were allowed until April 10 to submit briefs, after which the supervisor of hydraulics will give the proposition further consideration.

Handbook on Kitchen Unit Sales Campaign Is Published

Designed as an aid to companies planning kitchen-unit sales campaigns, a 46-page mimeographed handbook entitled "The Kitchen Lighting Campaign" has been published by The Society for Electrical Development. The manual is based on practical experience covering various phases of this business-building activity and is a consolidation of the experience and suggestions of a number of central station companies that have conducted campaigns.

The manual covers the conducting of a campaign from its inception to the final date of the drive and includes such topics as: Time and Duration of the Campaign; Fixing the Selling Price; Trial Offer; The Sales Force; Compensation of Salesmen; Contractor-Dealer Cooperation; Installation and Removals; Planning the Salesman's Call; Specimens of "Pep" Letters; and Installation, Information and Contract Forms.

The information contained in the handbook is in condensed form but is so prepared that central station executives easily may gain the fundamental points of such campaigns. The manual should be of value to any company planning a kitchen-unit sales drive.

Copies of the manual may be secured from The Society for Electrical Development, 522 Fifth Avenue, New York. The price per copy is $0.75 to members of the society and $3 to non-members.

New Unit at Big Creek No. 2 Placed in Operation.—The fourth generating unit at the Big Creek No. 2 plant of the Southern California Edison Company, Los Angeles, was placed in operation for the first time March 31. This generator is a Westinghouse horizontal type, similar to the other three machines already installed at this plant. It is a 3-phase, 50-cycle, 373 r.p.m., 6,600-volt machine with a capacity of 17,500 kva. It is connected directly to a Pelton impulse water wheel of 22,000 hp. under a head of 1,680 ft.

New Equipment for Vaca-Dixon Substation.—A large crew of men is at work at the Vaca-Dixon substation of the Pacific Gas and Electric Company making ready for the installation of new transformers and a 40,000-kva. condenser.

Pacific Coast Electrical Association

Arrangements for N. E. L. A. Convention Discussed at Meeting

The meeting of the executive committee for the National Electric Light Association convention in San Francisco was held at the Fairmont Hotel the evening of April 2. Frank A. Leach, Jr., presided, and Samuel H. Taylor acted as secretary of the meeting.

R. E. Fisher, chairman of the entertainment committee, reported that elaborate preparations were being made by a delegation in Los Angeles to entertain visiting delegates on the Red Special whose itineraries permit of a stopover in the southern city.

A. V. Thompson reporting for R. M. Alvord, chairman of the transportation committee, spoke in detail of the steps that have been taken in cooperation with the railroads to provide every possible facility for the convenience of delegates in arranging for their transportation and sleeping-car accommodations for return home from San Francisco. Matters under consideration call for special facilities to permit the validation of return tickets at the Auditorium and for telephone service through which sleeping-car reservations may be made.

Another activity of this committee will include the arranging of tours and sight-seeing trips to points of interest and supplying information to delegates concerning routes for returning visitors. There are to be no tours or sight-seeing trips or other diversions provided during the sessions. Delegates will be expected to give full attention to the serious side of the convention, and diversions and amusements will not be set up in opposition to the main object of the convention.

W. G. Vincent, Jr., chairman of local transportation, recapitulated his understanding of the responsibilities of his committee, which is expected to see that taxicab and automobile facilities are provided at all incoming trains for passengers and for the transportation of hand and other luggage from railroad and ferry terminals to hotels.

D. E. Harris, reporting for T. E. Bibbins, chairman of the reception committee, said that his committee was considering having reception committee personnel meet all incoming trains in order to provide personal services to guests. Tags for hand baggage giving names of delegates and their hotel destinations will be affixed to hand luggage before trains arrive in San Francisco in order that they may be transported to the various hotels in special motor trucks provided for the purpose.

P. M. Downing, chairman of the properties committee, reported that his committee was completely organized and would be ready to function as soon as he received plans and specifications as to just what conveniences and facilities he would have to provide at the Auditorium to take care of the requirements of the meeting.

A. H. Nicoll, reporting for C. E. Heise, chairman of the hotel committee, stated that already nearly 700 registrations have been made for out-of-town delegates. These have been principally from eastern points. The hotel committee is planning to have representatives at each hotel to take care of registration of guests and to see that they receive accommodations in accordance with their wishes.

Allen G. Jones, chairman of the registration committee, also reported that his committee was organized and prepared to function.

R. E. Fisher, chairman of the entertainment committee, reported further that he was making adequate preparation to meet the requirements of the program, which provided for the president's reception on Monday night, June 15; no formal entertainment for Tuesday night, June 16, leaving to the delegates the opportunity of contacting with their friends and of enjoying the dancing and other entertainment provided as a matter of routine at the larger hotels in San Francisco; the Public Policy meeting, on Wednesday night, June 17, to be held at the Auditorium, and a more general entertainment for all delegates to be provided at the Auditorium on Thursday night, June 18. The details of the program are now under consideration. Members of the entertainment committee will be stationed at all hotels through whom cards to golf clubs and other courtesies will be extended. A male chorus is being organized for community singing under the leadership of Harvey Milholland, who is in charge of the General Electric Company broadcasting station in Oakland. A plan for beginning the convention with a luncheon on Monday, June 15, under the auspices of the San Francisco Electrical Development League, is under consideration.

F. S. Myrtle, chairman of the publicity committee, reported on the steps that his committee had taken providing for a general campaign of publicity through the newspapers here and in the East and also in the trade press, increasing in intensity up to the time of the convention.

A. E. Rowe, reporting for J. B. Black, chairman of the general information committee, spoke of the services that were at the disposal of the committee through the Tourist League of San Francisco, whereby general information concerning the city and its points of interest would be disseminated by the trained operatives who were part of the regular staff of the Tourist League. The matter was taken under advisement and it is believed that the offer of the Tourist League probably will be accepted.

M. W. Scanlon, chairman of the advertising committee, outlined the plans his committee has made for advertising, including arrangements for an electric sign on the Ferry Building visible from both east and west, a "Welcome" banner across the Embarcadero; the display of flags and N.E.L.A. emblems up and down Market Street; the provision for "Welcome" banners at the various hotels and for 1,000 large-size posters for display about the hotels and larger mercantile establishments in San Francisco during the convention period.

The budget committee, through E. O. Shreve, chairman, obtained from various committee chairmen their estimates as to the amount of money required for carrying out their various responsibilities, and funds were allocated accordingly.

Announce Winners in Employees' Home Lighting Contest

Winners in the Employees' Better Home Lighting Contest conducted by the lighting bureau of the P.C.E.A. have been announced. Mrs. Doris Tracie, Pacific Gas and Electric Company, Redding, Calif., was awarded the first prize of $50 in cash. Mrs. Tracie's score was 90½ per cent. Second prize was awarded to H. N. Carroll, San Joaquin Light & Power Corporation, Fresno, who had a rating of 90 per cent; Miss Violet Paynter, Coast Valleys Gas & Electric Company, Salinas, received third prize with a score of 87½ per cent. Only one cash award was made by the lighting bureau in the contest.

Thirty-two primers were entered in the association's contest, these entries coming from five central station companies operating in the territory covered by the association. Cash awards were made by the individual companies for contests they conducted. The winning primers in the lighting bureau contest will be sent to the National Electric Light Association to compete in the national contest. The results of this national competition will be announced at the N.E.L.A. convention to be held in San Francisco, June 15-19.

Names of the first three prize winners in each company which entered primers in the P.C.E.A. contest are as follows:

Pacific Gas and Electric Company—
1. Mrs. Doris Tracie, Redding.
2. J. W. Starr, San Francisco.
3. H. R. Jenkins, Corning.

San Joaquin Light & Power Corporation—
1. H. N. Carroll, Fresno.
2. M. P. Lohse, Fresno.
3. Miss Genevieve Wren Sawyers, Fresno.

Coast Valleys Gas & Electric Company—
1. Miss Violet Paynter, Salinas.
2. Paul Walker, Salinas.
3. Miss Hannah A. Pederson, Salinas.

Southern California Edison Company—
1. Miss Erma Richardson, Redondo Beach.
2. Mrs. J. W. Rehm, Redondo Beach.
3. Miss Juanita Rapelje, Alhambra.

The Great Western Power Company conducted its contest along division lines, the first prize winners in each division being as follows:

D. G. Kramer, San Francisco division.
R. R. Greig, Oakland division.
E. F. McDaniel, Sacramento division.
Gean Russell, Northwestern division.

Judges in the lighting bureau's contest were: V. W. Hartley, chairman Employees' Better Home Lighting Committee; M. C. Hixon, General Electric Company, and E. Zimmerman, Pacific States Electric Company.

Final Bureau Reports Are Presented at Commercial Section Meeting

Activities of the Commercial Section of the Pacific Coast Electrical Association for the year 1924-25 culminated in a general meeting at Fresno, Calif., April 3-4, at which approximately fifty members of the section discussed the committee reports which will be presented this year. Since the holding of the National Electric Light Association convention in San Francisco will preclude the possibility of discussing the reports in open meeting, the entire time of the Fresno sessions was devoted to reading and discussing the reports which will be published in the June 1, 1925, issue of the Journal of Electricity.

The reports of the lighting bureau this year will deal primarily with the two lighting schools which were held in Los Angeles and Oakland in January and February, under the direction of Clark Baker. Another activity taken up included work with the California Committee on the Relation of Electricity to Agriculture in the matter of lighting farm homes.

The customer relations bureau has prepared an extensive set of suggestions for employees governing their relations with the public. This report will be reprinted for distribution.

The work of the power sales bureau included studies of central station energy in competition with waste heat generating plants in cement mills, hotels and laundries, as well as competition with Diesel engine plants. The reports of this committee will not be published in full but will be briefed in the general committee report. Copies of the various papers in full may be secured from the committee chairman. The same is true of the papers of the industrial heating committee.

The transportation bureau reported that a series of letters directed to the attention of central station executives and another directed to prospective electric truck users have been prepared by the bureau and are being sent out at the present time.

The appliance bureau presented two reports, one of which was referred back to the committee for corrections.

The greatest interest was displayed in the reports of the cooking and water heating committee. Under the direction of Roy Bragg of the Vallejo Light & Power Company, this committee made an extensive study of metered water heating in California for the purpose of guiding those utilities in other sections of the country in the development of this load. The report on electric ranges showed that as a result of a 24 per cent increase during 1924 in the number of ranges connected the total for the state is now 21,076. A report on air heating will present in tabular form all of the data necessary for calculating an electric air-heating installation as well as a study of the cost of operation of installations already made.

A. M. Frost, chairman of the Commercial Section, instructed members of the section to prepare written discussion of the reports for publication in the annual proceedings of the association, as there will be no opportunity for discussing the papers at the annual convention of the N.E.L.A.

Bureau Activities at Fresno Meetings Reviewed in Brief by Chairmen

More work was done and greater accomplishment noted incident to the recent technical conclave held in the new San Joaquin Power Building at Fresno, Calif., than at any other meeting of the current year. Several facts probably contributed to this condition. That this meeting practically took the place of the usual annual convention made it incumbent upon bureau chairmen to see that the yearly activities of each division were brought to completion at this time. Further, the organization had been working together for a year, or the better part of a year, and thus overcome the starting friction quite completely.

Plans adopted providing for a vice-chairman for each bureau will go a long way toward keeping the machinery of the Technical Section in continuous motion, thus avoiding the lost motion and time incident to the usual starting of a new year's work. Each bureau definitely decided upon recommended subjects for its consideration next year. This means that at the first meeting next fall progress reports can be made instead of time being spent in deciding upon what to do for the year's activities.

A resume of the results of the Fresno meeting of each bureau has been prepared by the respective bureau chairmen and is presented below. Through the full cooperation of all parties concerned it is possible to publish all of these reports together at this time.

Accident Prevention Bureau

J. M. BUSWELL, Chairman
San Joaquin Light & Power Corporation, Fresno, Calif.

The meeting was called to order by the chairman at 10 a.m. March 25, with Dr. Chas. E. Mordoff and Walter L. Smith present.

All of the papers had been placed in the hands of the chairman or in the hands of the other members of the committee prior to this date. As these papers or reports previously had been discussed fully and were at this time considered to be practically in final form, there remained only the task of editing the papers for publication.

The following papers were placed in form for publication:

1. First Aid Instruction. A discussion of the value of it.
2. Best Form of Organization for Accident Prevention and First Aid Work.
3. Best Form of Standard Code of Safety Orders and Safe Practices.
4. A Few Important Safe Practices.
5. A Few Special Tools and Devices.
6. Safety Bulletins.
7. Accident Prevention Course or Course in Safe Practices for Linemen.

The above mentioned papers are expected to be published at an early date. Therefore, discussion of them is unnecessary at this time.

The bureau chairman expressed appreciation of the work done by the members of the bureau and the fact that all of the papers were completed at this time.

The work was carried on during the year through the early assignment of the above subjects to the members who then proceeded to send out standardized questionnaires. Composite reports were made from the answers to these questionnaires.

The majority of the members of this bureau are engaged in other than full-time accident prevention or safety work. Therefore, it is felt that the work performed has been of a value acceptable to the operating and construction personnel of the member companies.

Correspondence with the national committee covered subjects being studied by that body as follows:

a—Publicity in Connection with Accident Prevention, Resuscitation, Public Safety, etc.
b—Operating Methods as Related to the System Dispatcher and Interconnecting Problems.
c—Radio Hazards.
d—Electrical Apparatus.

The chairman reported having presented an Insull Medal to Charles Gillis Gaertner of the Southern California Edison Company at Santa Paula, and the receipt of advice from S. M. Bullis of The California Oregon Power Company covering successful resuscitation performed by H. Dynan of that company. This latter case is being investigated to determine if Mr. Dynan is entitled to an Insull Medal.

Announcement was made of the next Pacific Safety Conference to be held at Los Angeles, May 6-8 ,with the suggestion that it would be of interest to the members to attend.

Report was received from the national accident prevention committee to the effect that a photographic flashlight ignited beneath a 30,000-volt line or bus would probably result in a flash-over. Notice of this was sent out as a warning against photographers taking flashlights around electrical apparatus where the fumes from the flash powder might rise or drift into the space between the high potential conductors thus ionizing this space and resulting in a flash-over.

In closing, the suggestion was made that next year's committee give some thought to the desirability of establishing in civic clubs, Boy Scout troops, and schools a reasonable training in resuscitation methods. It is believed that every person should be familiar with such methods, which are applicable alike in cases of drowning, asphyxiation, and carbon monoxide poisoning in the home or garage, as well as electric shock.

Also the succeeding committee's attention is called to a discussion provided by W. E. Richmond, one of the members of this bureau, who points out the advisability of taking more interest in the lives of employees "off their jobs."

The bureau recommends a continued study of all of the above subjects, and that during the coming year particular

effort be made to standardize the practices of the companies along those lines which have been found most effective. In addition it is recommended that a standard form for accident statistics be developed during the coming year so that comparisons may be made of the experiences of districts and departments within companies. This will also afford comparison of the experiences of the member companies.

Accident statistics have been developed to some extent this year, particularly by the larger companies. During the coming year additional effort should be made to get these into standard form.

The San Joaquin Light & Power Corporation made provisions to exhibit the "hot line tools" developed by employees of that company for making taps, changing insulators and so on, on 11,000-volt lines without interruption to service. These tools were demonstrated in actual service on a line near the city of Fresno.

Apparatus Bureau

C. E. SCHNELL, Chairman
San Joaquin Light & Power Company,
Fresno, Calif.

The apparatus bureau held a two-day session, during which the average attendance was forty-five. Points of contact with the electrical apparatus committee of the National Electric Light Association were reviewed. The program of the year was discussed carefully and a number of reports of special interest were presented as follows:

Oil circuit breakers and how best properly to increase their rupturing capacity, and the use of one oil in all oil-immersed apparatus, were topics of greatest interest among all those studied. New problems are arising constantly concerning this equipment. A standard record form for use in the study of oil-circuit-breaker operation for use of all member companies was adopted.

Fire prevention and fire-fighting equipment were discussed carefully, especially as to the means employed to prevent and extinguish fires in generators, transformers and cell structures.

An interesting discussion on station electrical grounds and control of grounds brought up many points as to how to care for this very important problem properly. Tests of grounds were reported upon.

The many problems of polarity, ratio and new developments of transformers were reported upon and carefully considered.

Relays and relay application were topics which took up considerable time, and those present entered freely into discussion of the problems of their system. New developments in relays were pointed out and many interesting features brought out by analyzing operating conditions.

Review of information at hand disclosed the fact that automatic substations now installed were requiring less maintenance and giving better service than previously had been thought possible.

The value of the work of the apparatus bureau is self-demonstrating. It is believed that these studies have a direct relation to and bearing upon the reduction of operating costs and investment charges. The studies of methods for increasing the rupturing capacity of existing oil circuit breakers; the use of a common oil for all oil-immersed apparatus; the proper application of protective relays, and proper and adequate fire-fighting equipment all have as their objective the prevention of service interruptions and the prevention of equipment destruction. These are the most important studies of the bureau.

The program for the ensuing year was considered carefully and tentatively decided upon as follows:

1. Pacific Coast Practices in Transmission and Distribution Substations.—This should be the major topic.
2. Tests of Station Grounds — Further information on this subject is very desirable.
3. Oil Circuit Breakers:
   (a) Report of any tests which may be conducted by Pacific Coast companies.
   (b) Gather data and study oil circuit breaker operation by a special committee in conjunction with the member companies in the use of form adopted by apparatus bureau at Fresno meeting.
4. Review of Transformer Voltages in Conjunction with the Overhead Systems Committee.
5. Relays and Relay Applications:
   (a) New types of relays for the protection of transmission networks.
   (b) New types of relays for the protection of internal trouble in equipment.
   (c) New or unusual application of older types of relays.
6. Lightning Arresters.
7. High-Tension Fuses.
8. Carrier-Current Telephone Communication. (This last topic not definitely decided upon.)

Hydraulic Power Bureau

R. M. PEABODY, Chairman
Southern California Edison Company,
Los Angeles

The first subject considered was the report of the hydraulic power bureau on hydroelectric plant layouts, which was the main subject of the year. This same subject also was assigned to subcommittee No. 2 of the National Electric Light Association. The national organization has decided to withhold publication of their subject pending the receipt of reports from more of the Eastern companies.

The report of the Pacific Coast Electrical Association is complete. This report covers twelve plants of six California companies and will be published as part of the yearly proceedings of the Pacific Coast Electrical Association. The complete report which covers represenative plants all over the country, and of which the report of the local bureau is to be a part, eventually will be published by the National Electric Light Association in a form similar to that used in the report on steam plant layouts already published by the national prime movers committee.

A progress report on the mechanical reliability of hydroelectric units was received from the Pennsylvania Electrical Association and discussed at the recent meeting. This report covers data received from twenty-one Western plants for the year 1924, giving the number of hours of outage due to mechanical and hydraulic troubles. The percentage of outage hours was compared with a similar report on steam turbine units.

A paper entitled "Is the Modern Vertical Hydraulic Turbine the Ultimate Type?" was read by Mr. John Sturgess of the Worthington company. Written discussion on this subject was submitted by E. A. Crellin of the Pacific Gas and Electric Company and E. C. Hutchinson of the Pelton Water Wheel Company.

After considerable discussion, the committee decided upon certain subjects to be taken up for next year's work. The subject which was considered to be the most important and which was recommended for the most careful study next year was "The Effect of Speed Regulation and Water Hammer on the Design of Pressure Relief Valves, Penstocks and Surge Chambers." It was recommended also that subcommittees be appointed to carry on the study of and to make progress reports upon the following subjects:

1. Mechanical reliability of hydroelectric units.
2. Investigation of silt deposits in conduits.
3. Obstruction of flow due to vegetaable growth in conduits.

It was suggested but not definitely recommended that a subcommittee draw up a code to cover permissible working stresses and specifications for the manufacture of steel penstocks, particularly as regards welded and seamless pipe. Among the other subjects discussed were the grounding of generators, the painting of penstocks, evaporation and percolation in storage reservoirs, and expansion joints in penstocks.

Inductive Co-ordination Bureau

L. J. CORBETT, Chairman
Pacific Gas and Electric Company,
San Francisco

The program adopted at the September meeting was outlined in detail by the chairman, who called attention to the magnitude to which the matter of radio interference had grown. This subject was delegated to this bureau by the executive committee subsequent to the September meeting. In accordance with the program as outlined, the active problems and solution of cases of telephone interference were first considered. Recent tests on the Merced-Yosemite parallel were outlined by H. N. Kalb of the San Joaquin Light & Power Corporation. A communication relative to interference from series lighting circuits elicited many comments and some discussion. The decision of the Railroad Commission and the Supreme Court in the case of the Postal Telegraph Company versus the Pacific Gas and Electric Company also came in for its share of discussion.

Cooperation of this bureau with the national committee includes the gathering of data on existing parallels and co-ordination methods used and the transmission of this information to the national field investigation subcommittee. Generous cooperation on the part of the Pacific Telephone & Telegraph Company made possible the gathering of information for the reports of the various companies from their own records, which are necessarily complete.

The group representing the West on project committee No. 3 of the National Electric Light Association is composed of D. I. Cone of the Pacific Telephone & Telegraph Company, L. J. Corbett of the Pacific Gas and Electric Company, L. J. Moore of the San Joaquin Light & Power Corporation, and J. E. Wood-

bridge of Ford Bacon & Davis, Inc. This project committee has for its object the study of residuals. Some tests already have been made on the system of the Pacific Gas and Electric Company between Cordelia, Sacramento and Knights Landing. The report of the tests on the San Joaquin system between Merced and Yosemite, together with reports of tests which are contemplated on the lines of The California-Oregon Power Company, are to be incorporated in the report of the Western group to the national committee. Valuable information on residuals will be yielded through these reports.

An expression from the Western companies as to the preferred wave bands for power company use in space broadcasting, or point-to-point radio service, was requested by W. J. Canada at the convention last June. An additional wave band was made available for point-to-point communication by action of the third general radio conference in Washington last October. This band is from 133 to 150 meters. Power companies are advised to use this band rather than the present overcrowded point-to-point band from 1,578 to 1,910 meters.

Radio interference formed the subject of discussion for the remainder of the meeting. Reports are being gathered from all member companies for records of the bureau. These will be transmitted to the radio subcommittee of the national co-ordination committee as well as being studied carefully by this bureau. These reports show that the problem has grown in all parts of this geographical division. Much wasted effort due to the independent work done by members of the different power company organizations in developing methods of locating causes of radio disturbances also is shown to be a fact incident to the earlier stages of this growth. In the earlier work only about ten per cent of the complaints were found to be due to faults on the power lines or in power equipment, the balance of the trouble being due to faults in the set itself, the wiring on the premises, electric utensils, bell ringing or alarm systems. At present, however, this ratio is higher, due to the fact that the radio public, or those who act for it in the matter, is becoming more familiar with the different types of interference and does not report quite as many troubles which are obviously not power apparatus troubles. A number of typical cases was discussed rather thoroughly.

The policy of all companies heard from to date is to repair any faults in equipment found to be causing radio troubles, and to cooperate in locating such faults. Many companies have purchased equipment for tracing radio troubles and are keeping card records which are of considerable value in classifying these different troubles and making them available for future reference. It was urged that all companies keep dated records classifying the type of disturbance, the method and equipment used, the cause or causes, the remedy and the man-hours consumed in each case.

The tendency of many radio enthusiasts to blame the power companies for all troubles occurring was discussed at some length. The bureau now has a contact with the Radio Trade Association of San Francisco. This is possible through the fact that the chairman of this bureau is the power representative on the technical committee of the association. One of the major objects of the committee is to study thoroughly the radio interference problem because of its effect on the radio public and consequently the radio trade. It is believed that the actual part played by power lines in such interference can be given its true weight in the discussion of this committee to the advantage of all concerned.

In Portland, Ore., a series of conferences instigated by the Radio Dealers' Association of that city and attended by representatives of the different electric public utility organizations interested, is being held to discuss local radio interference problems. These movements give promise of progress toward improved relations between all parties concerned because of a better understanding of the problems involved.

A letter from the Department of Commerce to the National Electric Light Association was read to the bureau by the chairman. This communication pointed out certain suggestions which had been brought to the attention of the department. The following were among the suggestions: That each company procure a radio compass or direction-finding set for locating the sources of radio interference; that companies install small receiving sets at substations, that would indicate when radio-frequency currents were superimposed upon the lines, and that a circuit be developed which would drain away any such current without interfering with line operation. The discussion which followed the reading of these suggestions showed that many companies already were using direction-finding sets, but that the indicating receiving sets to be of any actual service would have to be installed upon the lines themselves and not in the substation. Further it was pointed out that the addition of drains to high-tension circuits was not practicable, although they were successful on telephone and bell-ringing circuits.

The report of subcommittee No. 6 of the third general conference on radio matters discusses quite fully the various sources of radio interference. In this report the space given to the consideration of power-circuit interference with radio communication is significantly small compared to the space given to the discussion of the various sources of trouble in radio equipment and practice.

The different types of equipment used by the various companies for tracing faults causing radio disturbances was described in rather complete detail. The various qualities of these sets with regard to their adaptability to the work in hand were carefully analyzed. It is proposed to publish in the near future an interim report dealing with the radio problem in general and the various sets and methods found effective for solving radio interference difficulties.

For the coming year the bureau hopes to continue the collection of records and the exchange of information on this important problem. Activities pertaining to inductive co-ordination with the communication interests also are contemplated for next year's work. In addition to this, publicity work is to be done through both the technical and popular press for the purpose of clearly bringing before the public the problems and cooperative attitude of the power companies in the matter of radio interference.

Meter Bureau

G. H. Searle, Chairman
Pacific Gas and Electric Company,
San Francisco

A. L. Duesbury, of the Western States Gas & Electric Company, chairman of the committee on education of metermen, was not present, but sent word that the third annual course for metermen will be held at the University of California at Berkeley May 11-16, inclusive. Housing conditions will be the same as last year. The cost of the course will be eight dollars per student. No outline of the course is available at this time. It was decided not to hold a parallel course in the South this year.

It was reported that the University of Arizona will hold its second annual course for metermen April 2, 3 and 4.

E. Ealson, of the Southern California Edison Company, read the report of his committee on "The Use of Oil in Meter Bearings." As definite conclusions on this subject cannot be reached, it was decided to discontinue the investigation.

A report of investigation of the accuracy of various low-cost methods of high-tension metering was read by W. N. Lindblad, of the Pacific Gas and Electric Company, chairman of the committee on this subject. After an interesting discussion the continuation of this study was recommended.

The secretary read a paper by J. R. Paget describing recent developments in the meter field. This report included new auxiliary devices developed by members, as well as the recent developments of the manufacturers. A study of some of the devices mentioned is to be made.

The proper size meters for various installations has been the subject of an investigation by C. F. Gilcrest, of the San Joaquin Light & Power Corporation, who reported on the data secured to date. Further investigation is to be made along the same lines.

The chairman read a report of progress by T. S. Capek on his subject, "Meter Test Period." Study of this subject is incomplete and will be continued next year.

J. C. Alberts, of the Bureau of Power & Light, Los Angeles, presented a comprehensive report on the effect of wave form on the operation of induction relays, with a recommendation covering proper test methods to eliminate errors from this cause. This report elicited an interesting and lengthy discussion in which all members participated.

Overhead Systems Bureau

E. Y. Porter, Chairman
The Southern Sierras Power Company,
Riverside, Calif.

The meeting of the Overhead Systems Bureau was marked by a good attendance and a very lively interest and discussion.

The subject receiving the chief attention of the delegates was the revision of the Railroad Commission's General Order No. 64 covering line construction rules. The subcommittee having this matter in hand, under the chairmanship of J. E. Macdonald, secretary of the Joint Pole Committee of Los Angeles, was organized for the purpose of recommending to the Railroad Commission such changes and clarifications of G.O. 64 as were deemed advisable in the interests of safety and improved overhead line construction.

For this purpose cooperation was invited, and delegates were in attendance

from all public utilities and interests having any direct relation to the subject. These included not only the power companies but representatives from the telephone companies, railroads and street railways, the municipalities of Los Angeles, Pasadena, Glendale and San Francisco, and the Railroad Commission. The subcommittee had prepared a complete redraft and revision of the Order No. 64, since the January meeting in San Francisco, and this draft was taken up in detail and thoroughly discussed. The discussion occupied a day and a half, and the results after careful co-ordination and editing by the subcommittee will be presented to the Railroad Commission as the practically unanimous consensus of opinion and recommendation of the industry. It is believed that the work of this subcommittee will prove of great value, and it is hoped and believed that its recommendations will meet with favorable consideration by the commission.

Another important phase of the Overhead Systems Bureau was reported by Messrs. Carlson, DeWitt and Young, representing E. H. Steele, chairman of committee on poles, who was unable to be present. Details of design and results of tests on four types of steel poles, each approximately 63 ft. in height and designed to carry two 4/0, 60-kv., three-phase circuits, were given. The designs and results of tests were such that it is believed a considerable degree of standardization of steel poles for lines of from 11 kv. to 110 kv. is practicable. It is hoped that the utility companies will find it to their interest to make use of these designs so that in the near future steel poles of standard design can be carried in stock, resulting in reduced costs and prompt shipments.

The tests indicated satisfactory results from poles set directly in the earth, without concrete footings. Each type of pole was tested with both earth and concrete footings.

It was unfortunate that the report was presented during this, the last session of the year, when it was impossible to devote as much time as desirable to discussion. A very general and keen interest in the subject was manifested.

This report will constitute the contribution of the Pacific Coast Electrical Association to the work of the national overhead systems committee.

Report was made also on the results of tests on wood poles, both new and old, and including full length "Reuping Process" creosote-treated Douglas Fir (Oregon Pine) poles.

Mention also was made of a process of wood preservation, which originated in Germany and has been used for a number of years in central Europe with good results. The preservative is known as "Wolman Salts," and the process of application is by closed cylinder vacuum and pressure treatment similar to that employed in the "Reuping" or other pressure methods of impregnating with creosote oils. The claims made for this process are such that further investigation and report by this committee will be awaited with much interest.

H. H. Minor presented an interesting report for the committee on testing high voltage insulators in service. He reviewed the various methods which had been used by a number of operating companies and also covered some late developments of radio devices which have been adapted for this purpose.

Although not originally a part of the work of this committee, a most interesting report was made of the tools and methods for maintenance of energized high voltage distribution lines (11 kv. and 33 kv.) as developed by the San Joaquin Light & Power Corporation under Mr. Minor's direction. The subject was of such interest and importance that this committee was requested to include it in their program and submit a full report on it at an early date. A demonstration was given of this work by one of the San Joaquin Light & Power Corporation's three-man crews that was witnessed by a large number of the delegates and elicited many complimentary comments. The demonstration included:

(1) Tying in a hot 11-kv., 3-phase line on a new pole, previously set in the line, including untying and retying one wire.

(2) Replacing a broken pin type insulator, requiring 11 minutes elapsed time between arrival and departure of the truck.

(3) Replacing a dead end insulator—4½ minutes.

(4) Cutting in a branch line.

H. Michener, chairman of committee on 220-kv. transmission, who is also chairman of the national committee on the same subject, read a most interesting report on various phases of extra high-voltage transmission. Several new projects of this class are under consideration, but none outside of California are sufficiently advanced for reporting at this time.

N. B. Hinson made a progress report for the committee on line transformer standardization, presenting recommendations for standard hangers and external dimensions and position of case on hangers. This work will be continued.

Mr. Hinson is also acting as chairman of the committee on line construction costs, in place of R. E. Cunningham, and reported progress on the work of this committee. No definite report on this subject will be made this year, however, since it will be necessary to collect a large amount of data not yet available.

Prime Movers Bureau

C. E. STEINBECK, Chairman
Pacific Gas and Electric Company, San Francisco

A brief summary of the work of the committee at the San Francisco meeting was made by the chairman. The committee was also informed that reports requested by the national prime movers committee had been sent in.

L. J. Kraps, of the Southern California Edison Company, gave a very complete description of the heat balance of that company's new steam plant at Long Beach. The equipment of this plant was discussed at some length.

A report by C. R. Stewart of the same company, giving data on tests of various makes of firebrick, was taken up.

The following subjects were suggested by the committee for next year's study:

1. Mechanical oil burners and equipment.
2. Condenser leakage.
3. Cooling towers, Design of.
4. De-aeration of boiler feed water.
5. Design of modern stand-by plants.
6. Heat balance and stage bleeding.
7. Station auxiliaries in modern plant.

Safety Rules Bureau

W. H. TALBOTT, Chairman
San Diego Consolidated Gas & Electric Company, San Diego, Calif.

It is reported that the revised edition of the Electrical Safety Orders of the Industrial Accident Commission of the State of California are now in print and awaiting public hearing. It was deemed advisable that members of this bureau make every effort to obtain copies of this new edition as far in advance of the date of the public hearing as possible. This will enable a careful study of the new rules in order that any serious omission or necessary correction may be detected prior to the time of the public hearing. It is understood that the requirements for meter and load-testing facilities have been eliminated. Representation in the State Association of Inspectors is the feature upon which the bureau has been working for some time. Announcement was made of the fact that arrangements had been made which were satisfactory to all parties concerned, including the executive officials of the association and the Technical Section. The chairman pointed out the fact that the appointment of members to this association from each of the power companies would make possible the attendance of at least one representative of this bureau at practically all meetings of the association without involving any great amount of traveling.

It was considered highly advisable that the bureau closely keep in touch with the proposed changes in the 1925 Code of the National Board of Underwriters. Undoubtedly one of the most important subjects involved is that of grounding. It was suggested that the members of the bureau discuss this particular phase with the inspectors in their respective territories. N. B. Hinson, of the Southern California Edison Company, gave a comprehensive report covering the results of elaborate tests which had been made to determine the relative results of currents in conductors enclosed in iron conduits, conductors not enclosed but in parallel with iron conduits, and conduits not enclosing a conductor but acting as a conductor.

Safety switches and electric range and heater installations were reported upon by their respective committees and satisfactory progress noted in the work of these committees.

Complete cooperation and harmony between the Safety Rules Bureau of the Pacific Coast Electrical Association and subcommittee No. 4 of the National Electric Light Association would be mutually advantageous.

Necessary and important subjects which were suggested for study next year are as follows:

(a) Safety orders, application of (keeping in mind the matter of providing for test facilities).

(b) National electric code—to secure copies of tentative changes and outlines, suggested changes and tie-in with the State Association of Inspectors through the representatives of this bureau on that association.

(c) Grounding problems and requirements.

(d) Safety switches—tying in with the meter committee on this subject.

Underground Systems Bureau

C. H. JENKINS, Chairman
Los Angeles Bureau of Power and Light.

Concrete duct construction was discussed. A comparison was made showing quality of concrete duct to the practically the same in the West as in the East where it is used so extensively by nearly all of the larger companies.

The use of concrete in monolithic duct construction was described, and photographs were exhibited showing the method of construction by use of a machine.

The use of quick-setting cement in manhole construction was discussed. Some Coast companies are using this class of cement for this purpose. One company reported the use of a cement which is guaranteed to give greater strength in twenty-four hours than ordinary cement will in twenty-eight days. This is done to permit the passing of traffic over manholes where they are located in congested districts without great delay after pouring of the roofs.

A report was given on the submarine cable across the Mississippi River at St. Louis that is operating at 35,000 volts. This cable is the armored triplex type laid on the bed of the stream and anchored at several points to prevent movement. It has been operating for several months without failure.

The locating of faults on submarine and drawn-in cables by voltmeter and exploring coil methods was discussed. This discussion revealed that several of the companies on the Coast are using the exploring coil fault-finder with good results.

The use of the Kenotron testing set and its application to the testing of faults on underground cables was explained.

The subject of the spiking of cables was covered, and the various methods in present use in both the East and West were explained.

Considerable discussion was had regarding factory test and inspection of cables. The general opinion was that this was proper and productive of beneficial results.

An interesting discussion of high-voltage cables took place in which the ionization of the insulation was explained. A paper was read by the secretary giving the make-up of a high-voltage Simplex cable manufactured in Europe that is operating in parallel with an overhead line at 135,000 volts between phases and soon will be placed in operation in series with the overhead line. Neither the cable nor pothead has failed. The success of the cable seems to depend largely upon the use of a light oil for impregnation and graded insulation of the conductor. It was reported also that tests are being made on cables of similar design by American manufacturers.

The question of creepage of cables due to heating was discussed. Large Simplex cables carrying heavy currents seem to be the only cables seriously affected.

The committee recommends the following points of interest to be followed for next year:

1. Improve design in outdoor and indoor cable terminals.
2. Study of the Kenotron testing set.
3. Metal conduits as used for underground laterals, particularly as to the treatment of these conduits, in order to lengthen their life in the ground.
4. High voltage underground cables.
5. Cement duct.
6. Junction boxes.

News of the Electragists

New Code Discussion at Annual Meeting of League

The Electrical Development League of the Monterey Bay territory held its annual meeting at the Appleton Hotel, Watsonville, Calif., on April 8, with forty-seven present. The meeting was presided over by the retiring president, Roy Nash of E. Roy Nash Company, Inc., of Monterey and Salinas.

Claude W. Mitchell, electrical engineer of the Board of Fire Underwriters of the Pacific, was the principal speaker of the evening. He said the Board of Fire Underwriters considered electricity the safest fuel for light, heat and power, if properly installed and used. He pointed out the fact that records show that the majority of cases of fire or accident from electrical causes are produced from the misuse or abuse of electrical appliances. Mr. Mitchell expressed the belief that the National Electrical Code is the best known standard for electrical installations, and urged its adoption without local rules. He pointed out the value of the Inspectors Association in obtaining a uniform interpretation of the code. He also called attention to the need of electrical inspection in rural districts.

Mr. Mitchell discussed many of the changes in the 1925 issue of the electrical code and answered questions asked by those present. Particular reference was made to grounding requirements, the use of lead-covered cable for underground services; and the use of identified wire, the speaker stating that it was the intent of the code committee that white or identified wire be used only where the neutral is grounded. He stated a two-pole switch could be used for range installations and that it could be placed on a service porch or in an adjoining room as long as it was readily accessible. In speaking of single-pole fusing he said that in order to get utmost protection from grounding it was necessary that the solid neutral should be run straight through to the last device.

The following officers were elected for the ensuing year: President—Walter Cox, Cox Electric Company, Santa Cruz; vice-president—B. H. Kirkman, Just-Rite Electric Works, Watsonville; secretary-treasurer—Philip S. George, Coast Valleys Gas & Electric Company, Salinas. To the board of directors were elected, in addition to the officers, Roy Nash, E. Roy Nash, Inc., Monterey and Salinas; R. Wright, Wright Hardware Company, Pacific Grove; A. L. Johnson, Hollister; Lisle Bagwill, The Electric Shop, Morgan Hill; Morris S. Wales, Coast Counties Gas & Electric Company, San Francisco, and George Slavich, King City Electric Company, King City.

Electragists Attend Opening Baseball Game in a Group.—The occasion of the opening of the Pacific Coast League baseball season was celebrated fittingly by the electragists of the San Francisco Bay territory with the customary lunch at the States Restaurant, after which they attended the game. One hundred tickets in a group had been secured by Grover Anderson and distributed at the meetings of the San Francisco Electrical Development League.

The Glenn County Electric Works of Willows, Calif., recently has completed the electrical contract on two new highway bridges which have been built by the state and county. One of these has been built on the highway from the south and the other from the east of Willows. An archway has been constructed over the top of these two bridges on which the word "Willows" is inscribed. This will be illuminated. The Glenn County Electric Works also has installed the electrical wiring in a creamery of the Western Meat Company that was recently opened in Willows.

The Fred Foote Electrical Shop, Grass Valley, Calif., recently moved from Main Street to new and larger quarters on Mill Street. An electrical display was held during the first week in the new location. Mr. Foote is well known among the electrical fraternity, having been associated with the Pacific Gas and Electric Company and also the Empire Mine Company in that district.

U. G. Scott, formerly at 8622 S. Vermont Avenue, Los Angeles, has moved into his new store in the industrial district at 5705 S. Central Avenue. In addition to general electrical contracting, he will specialize on industrial, commercial and motor installations.

Frank McGinley, Harbor Electrical Company, Wilmington, signing application blank No. 1 in the California Electragists from the Southern Division, March 26, 1925.

California Electragists Plan for Visalia Meeting

Plans have progressed rapidly for the quarterly meeting of the California Electragists to be held at the Hotel Johnson, Visalia, Saturday, May 9, 1925. Arrangements have been made with the Southern Pacific Company for special Pullman cars on the night train to accommodate those leaving from the Bay district. It will be necessary to leave the Ferry Building, San Francisco, at 11:40 p.m., Friday night, May 8; this train will arrive in Visalia at 8:50 a.m. Saturday. The train will leave Visalia Saturday night at 8:00 and arrive in San Francisco Sunday morning at 8:10. Tickets may be purchased only through the office of the California Electragists, San Francisco.

The executive committee meeting will be held at 9:30 a.m. Saturday, and the general open meeting at 1:30 p.m. Everyone in the electrical industry is invited to attend this meeting, for which an interesting program has been arranged. Details of the amalgamation with the Southern California Association of Electrical Contractors and Dealers will be explained at this time. Clyde L. Chamblin will report on the executive committee meetings of the Association of Electragists, International; the Society for Electrical Development; and the California Electrical Bureau. It is expected that definite progress will be made on the Read Seal house-wiring plan, and that it will be discussed at this meeting.

L. J. Curry, Curry Electric Company, Dinuba, and **S. Jorgensen**, Reedley Plumbing & Electric Company, Reedley, members of the Alta Electric Club, recently became members of the California Electragists.

G. R. Hartwig, recently has opened an electric store at 4305 University Way, Seattle. He has been in the electrical business in that city for twelve years.

The Western Radio Sales Company, Seattle, has established a new radio store at 4511 University Way, with E. Stevens as manager.

L. G. Jeffrey, Electrical Construction Company, Fresno, recently has become a member of the California Electragists.

Electragists Have Weekly Meeting in Modesto.—A group of electragists and others in the electrical industry have a weekly luncheon meeting every Friday at Modesto, Calif. These meetings are bringing about a friendly spirit among the members, and are used for serious study of the problems affecting the contractor-dealers and the power companies. Members of the industry are always welcomed at these meetings.

Fred R. Pardee, former member of Aylsworth & Pardee Electric Company at 111 N. Market Street, Inglewood, Calif., has recently opened a new store in his own name at 110 S. Market Street, Inglewood, where he is fully equipped to handle electrical contracting, in addition to having a complete line of fixtures and appliances.

A. R. Hancock Electrical Store, 135 South Tehama Street, Willows, Calif., recently has become a member of California Electragists.

Many Electragists Join San Francisco Electrical Development League.—At a recent meeting of the San Francisco Electrical Development League the following electragists were introduced as new members: Edward F. Dowd, Dowd-Seid Electric Company; Lloyd H. Flatland, Globe Electric Works; Chas. T. Lyman, Commercial Electric Company; C. C. Severin, Severin Electric Company; Chas. H. Shipman, Atlas Electric Company. A large percentage of the electragists in San Francisco are now members of the league and are giving their support to President "Cap" Kenney.

Electragist Elected President of San Jose Building Exchange.—Roy M. Butcher, electragist of San Jose, Calif., recently has been honored with the presidency of the Builders Exchange of Santa Clara County for the year 1925. Mr. Butcher has always been an active worker in the Builders Exchange as well as in the Electragists and other organizations.

R. L. Wells recently has become a partner of **R. S. Freels** of the **Delano Electric Shop**, Delano, Kern County, Calif. Mr. Wells has been superintendent of construction for the Southern California Edison Company in the Delano district for the last four years, and has been in the employ of that utility for the past twelve years. The concern will continue to operate as the Delano Electric Shop.

Webb & Hills have recently opened a new and distinctive electrical fixture and appliance store at 925 E. Colorado Street, Pasadena, Calif. T. E. Webb has been an electrical contractor in Pasadena for several years, and L. B. Hills is from Kansas. Alcoves have been especially arranged for separately displaying Colonial and English fixtures, as well as Spanish and Italian and Mission types, with appropriate backgrounds.

T. F. Ground has opened a new electrical store in the town of Encinitas Calif. In addition to electrical contracting, he will stock electrical appliances and radio. Mr. Ground is also specializing in industrial installations at Rancho Santa Fe.

C. & M. Electric Construction & Supply Company, Denver, a new retail establishment, has recently been incorporated by Walter Coburn, electrical contractor, at 50 Broadway.

Book Reviews

ELECTRICAL MEASUREMENT IN THEORY AND PRACTICE

By ARTHUR WHITMORE SMITH. 338 pages, 293 figures. $3. Published by McGraw-Hill Book Company, New York, N. Y.

This text book is intended for students who have had one year of college physics and who desire further knowledge regarding the theory of electrical and magnetic measurements. The treatment is such that the book could be used as a guide in laboratory work, but it treats of the subjects in sufficient detail that it could be used as text book as well.

The principles involved are amply treated with a view of assisting the student in reasoning out the various quantities rather than to memorize a formula. In this connection direct information is then replaced by suggestions as to how the knowledge may be experimentally obtained. The book is quite up-to-date in that the point of view has been taken that electrical currents are considered as the flow of electrons along the circuit. According to the author:

> "The time has certainly come when the electron theory of electrical phenomena should be presented to all of the students of physics and electrical engineering. Regarding the electron tubes used in radio communication, for instance, there is no doubt that the stream of electrons through the tube continues as an electron current through the connecting wires,"

This is in accordance with the ideas of modern physics and helps to tie in with the theories of the physicist in the application of practical electrical measurements.

The simpler and fundamental parts of the subjects are taken up in the first few chapters and in the first part of each chapter, while the more difficult measurements and methods involving more extensive knowledge of the subject are reserved until the student has obtained a greater proficiency. After the introduction covering units and definitions, chapters follow covering ammeter and voltmeter methods, ballastic galvanometer and condenser methods, the current galvanometer, the Wheatstone bridge, the potentiometer and standard cell methods.

This is followed by chapters covering measurements of current, measurements of power, electron tubes, and measurement of capacitance. A number of chapters are then given to magnetic and electrical units as well as to magnetic tests of iron and steel.

The latter part of the book covers induced electromotive force, measurements of self and mutual inductance, alternating currents and alternating-current measurements.

The treatment of the various subjects throughout the book is excellent. Special reference should be made to the chapters on electron tubes where methods are given for determining the fundamental characteristics of this very useful piece of electrical apparatus.

In regard to inductance and capacitance bridges, graphical methods have been introduced by supplementing the analytical methods so as to give a clearer insight into the relations of the currents and the electromotive forces in the various circuits. The diagrams are clear and in all cases sufficient explanation is given to assist the students in following out a logical derivation of the formulas involved in electrical measurements.

The book should not only prove useful to students of electrical engineering, but should be of considerable value in industrial electricity and in laboratories where it is necessary to refer to the fundamental methods of electrical measurements from time to time.

E. R. S.

Meetings

Seattle to Be Scene of A.I.E.E. Pacific Coast Convention

Under the general chairmanship of G. E. Quinan, chief electrical engineer of the Puget Sound Power & Light Company, Seattle, plans are under way for holding the Pacific Coast convention of the A.I.E.E. in Seattle, Sept. 15-19, 1925. Headquarters for the convention will be at the new Olympic Hotel. Tentative subjects for discussion have been chosen by the local papers and meetings committee, and have been presented to the national papers and meetings committee for approval. Definite announcement of these will be made later.

Among the interesting features of the convention planned for the entertainment of guests will be a trip by special train to see the Baker River development under construction by Stone & Webster, Inc., for the Puget Sound Uower & Light Company. If the details can be worked out the convention party will be transported the same day to Monte Cristo, a resort in the mountains near Seattle, to spend the night. A golf tournament will also be part of the convention entertainment.

Electrical Inspectors of State Hold Successful Convention

The California Association of Electrical Inspectors held its semi-annual meeting in San Francisco March 26, 27, and 28, 1925, with H. W. Stitt of Fresno, president, in the chair. He told of the formation of the organization and its progress along the lines of standardization of inspection and equipment.

George Kimball of the Industrial Accident Commission reported on the progress of the Safety Orders of the Commission. He stated that public hearings on the proposed orders would be held in San Francisco May 12 and in Los Angeles May 19.

A general discussion of the inspection work throughout the state was held, and many interesting points were brought out. R. W. Abright of Long Beach suggested that plans and specifications be submitted to inspection departments for checking before permits were issued. He also urged that inspectors cooperate with contractors, journeymen, architects and builders.

Rollin M. Smith of Los Angeles urged the adoption of the National Electric Code as a standard without local rules. The general sentiment of the meeting seemed to be that the principles presented were sound but that specific interpretation was needed.

H. N. Beecher of Los Angeles reported on the meeting of the Western Association of Electrical Inspectors which was held in Louisville, Ky. He mentioned many of the discussions held at this meeting, with particular reference to that on the question of electrical codes in general, and also on the use of gummed stickers attached to cabinet boxes or fuse blocks specifying the maximum fuse capacity allowed in branch circuits. He stated that the architects' specification committee had drafted a set of specifications to cover work out of architects' offices.

C. W. Mitchell of the Board of Fire Underwriters reported on the meetings of the electrical code committee. He stated it would probably be October before the new code would be available on the Pacific Coast, due to the details of preparation, as the electrical committee is now a sectional committee of the American Engineering Standards Committee, with the National Fire Protective Association as sponsor. Mr. Mitchell read a number of the new rules as they will appear in the 1925 Code.

The possibility of securing the Underwriters' inspection of lighting fixtures was discussed. The convention went on record as recommending to the laboratories and the manufacturers of lighting fixtures that they establish a standard for lighting fixtures, and stating that the organization would give its cooperation and support to this effort.

It was decided that a communication would be sent to the code committees recommending that provisions be made in the code requiring the grounding of portable appliances.

The question of rural inspection was discussed at some length, after which it was decided to leave the details of a possible solution in the hands of the executive committee.

One of the most interesting problems discussed at the convention was that of the diversity factor or the demand of heating and cooking installations with reference to the installed capacity. Data were presented on this subject from tests which have been conducted in various parts of the country. It was shown that for the same size installation a different demand factor existed in suburban districts as compared to the city.

A lengthy discussion was held on the attitude of the association on domestic installations which would have more than 120 volts to ground.

Various methods used for securing the rewiring of old jobs without resorting to actual condemnation were brought out. It also developed that contractors do not always cooperate with inspection departments in seeing that these jobs are properly installed, even though the work is started.

Efforts are to be made to secure greater credits from the Board of Fire Underwriters when the electric wiring is up to certain standards.

Wattage limitations for branch circuits and single-pole fusing and switching were also discussed at the meetings.

The following officers were elected to serve for one year, beginning Aug. 1, 1925: President—R. W. Abright, Long Beach; vice-president—B. C. Hill, Oakland; secretary-treasurer—C. W. Mitchell, San Francisco. The executive committee consists of: Active members—H. W. Stitt, Fresno, and H. J. Bickel, Martinez; industrial member—A. E. Rowe, San Francisco; associate member—E. J. Crawford, Fresno. The next meeting will be held in Fresno in September.

COMING EVENTS

Technical Section, Northwest Electric Light and Power Association—General Meeting—
Spokane, Wash.
April 16-17, 1925

Advisory Board, California Electrical Bureau—
Palace Hotel, San Francisco
April 24-25, 1925

Southwestern Public Service Association—
Annual Convention—Rice Hotel, Houston, Texas
May 5-8, 1925

Pacific Coast Electrical Supply Jobbers' Association—
Quarterly Meeting. Arlington Hotel, Santa Barbara, Calif.
May 7-9, 1925

Electrical Supply Jobbers' Association—
Annual Convention—Hot Springs, Va.
June 1-6, 1925

Associated Manufacturers of Electrical Supplies—
Annual Meeting—Hot Springs, Va.
June 8-13, 1925

Northwest Electric Light and Power Association—Annual Convention —
Gasco Building, Portland, Ore.
June 12, 1925

National Electric Light Association—
Annual Convention—San Francisco, Calif.
June 15-19, 1925

Oakland Electric Club Installs Officers for Year.—The installation of officers for the ensuing year recently held at the Hotel Oakland was the occasion of one of the most successful meetings of the Oakland Electric Club. L. F. Galbraith was chairman of the day. B. W. Hill, supervising electrical inspector for the City of Oakland, was installed as president of the organization with fitting ceremonies. He outlined the policies of his administration and announced committee appointments. S. H. Taylor, secretary of the Pacific Coast Electrical Association, was a guest at the meeting and told something of the convention of the National Electric Light Association which is to be held in San Francisco in June.

Jobbers to Meet at Santa Barbara.—The quarterly meeting of the Pacific Coast Electrical Supply Jobbers' Association will be held in Santa Barbara, Calif., May 7-9. Headquarters will be established at the Arlington Hotel.

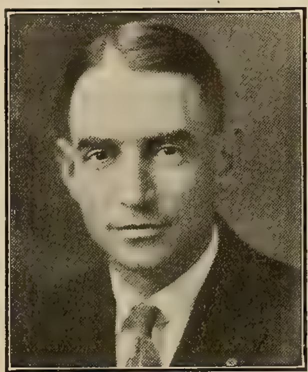
Provo Engineers Elect Officers.—F. W. Deming, city engineer of Provo, Utah, was elected president of the Provo chapter of the American Association of Engineers at its annual election held on March 29. He will succeed S. P. Stewart. J. D. Watson, of the Columbia Steel Corporation, was elected vice-president, and Earl Condor was re-elected secretary and treasurer. Directors named were: W. L. Whittemore, E. A. Jacob and J. U. Buchi. Plans for the state convention of the American Association of Engineers to be held in Provo May 2 were discussed, and details are being arranged by the officers of the chapter.

California Electrical Bureau Advisory Board to Meet.—The April meeting of the Advisory Board of the California Electrical Bureau will be held at the Palace Hotel, San Francisco, April 24-25. Matters pertaining to the work being done by the Bureau will be discussed at the meeting.

Pacific Gas and Electric Employees Meet in Sacramento.—Over 800 employees of the Pacific Gas and Electric Company gathered in Sacramento on March 26 to attend an entertainment arranged by the street-car division of the company.

Personals

C. F. Terrell, formerly superintendent of light and power, northern district, Bellingham, Wash., of the Puget Sound Power & Light Company, Seattle, has been promoted to be general superintendent of lighting and power of the El Paso Electric Railway Company, El Paso, Texas, a Stone & Webster property. He succeeds J. F. McLaughlin, who has been made manager of the Baton Rouge Electric Company, also operated by Stone & Webster, Inc. Mr. Terrell has been associated with the latter company for about twenty years, having worked in a power plant of one of its properties while attending college. After graduating from the University of Washington in 1910 as electrical engineer, he entered the Stone & Webster organization and has been with it ever since. While he was with the Puget Sound Power & Light Company in Seattle he held such positions as substation operator, load dispatcher, foreman of substations, construction engineer on station construction and superintendent of the substation department. Mr. Terrell was transferred about two years ago to Bellingham where, in addition to the duties of his position, he found time to be an active member of the Rotary Club and the Chamber of Commerce. He is also a member of the American Institute of Electrical Engineers. He is a native of Illinois.



C. F. TERRELL

W. A. White, director and chairman of the finance committee of the Washington Water Power Company, Spokane, and his son, **H. T. White**, of New York, also a director of that company, were visitors in Spokane recently on their annual inspection of the company on behalf of Eastern stockholders and investors. **D. L. Huntington**, president of the company, accompanied them on their return to New York.

E. C. Headrick, representative from the Mountain section on the national executive committee of the Association of Electragists, and a prominent Denver electragist, is attending the semi-annual meeting of the committee in New York City.

F. L. Easton, Rocky Mountain district representative of the Economy Fuse Company and a member of the advisory board of the Denver Electrical Cooperative League, has been elected president of the Denver Business Men's Art Club.

H. H. Daley, for many years associated with the Majestic Electric Appliance Company, San Francisco, has recently returned from a vacation trip through the East to take up his new duties as manager of sales of heaters and lamps for the Magnavox Company of Oakland.

T. S. Wood, formerly in charge of switchboard sales and engineering at the Atlanta branch of the Westinghouse Electric & Manufacturing Company, has been made transformer agent in Oregon and Washington for the Packard Electric Company, Warren, Ohio, with headquarters in Seattle.

A. C. Cornell, manager, Western Electric Company, Denver, has been elected a member of the board of directors of the Denver Athletic Club and appointed as a member of the finance committee which has just concluded a successful campaign for funds with which to double the club property.

Dana Pierce, president of the Underwriters' Laboratories, was a recent visitor on the Pacific Coast where he spoke at many meetings of electrical groups.

H. V. Mooney recently moved from San Francisco to Portland, where he will manufacture Wesix electric products under license from W. Wesley Hicks.

N. S. Reeson, electrical engineer in charge of the factory of the Gulf Electric Appliance Company, Tampa, Fla., was a recent visitor in San Francisco. The company is licensed manufacturer of Wesix water and air heaters in the southeastern states, and Mr. Reeson is studying manufacturing methods in this city.

F. J. Southerland, formerly new business superintendent of West Side Division of the Pacific Gas and Electric Company, Red Bluff, Calif., has been transferred to the general office of the company at San Francisco as competitive electric salesman. **J. D. Kent** of the sales department at Marysville succeeds Mr. Southerland.

W. C. Smith, transformer meter specialist, central station department, San Francisco, and **H. T. Plumb**, engineer, Salt Lake City office, were among the forty-three General Electric Company employees to receive Charles A. Coffin Foundation awards for the year 1924. The former won the award for recommending improvements in the design of transformers, and the latter for his activity in rescue work during the Castle Gate mine disaster in Utah.

J. P. Growdon, formerly in charge of all design on the Skagit River hydroelectric development of the city of Seattle, recently became associated with the Aluminum Company of America, Pittsburgh, as principal assistant to J. W. Rickey, chief hydraulic engineer. Prior to his connection with the Skagit project, Mr. Growdon was connected with The Washington Water Power Company, Spokane, and with the Northwestern Electric Company, Portland.

R. P. Ingalls, sales manager Simplex Electric Heating Company, Cambridge, Mass., was a recent visitor to San Francisco. Mr. Ingalls is making a survey of business conditions on the Pacific Coast.

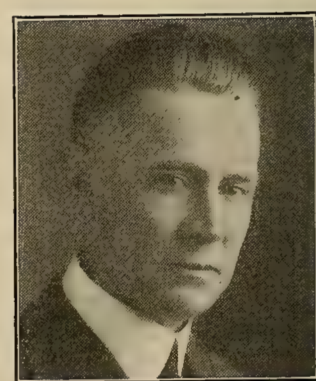
A. B. Cayo, for many years in the overhead distribution department of the Portland Electric Power Company, Portland, recently has been appointed assistant superintendent in that department. He will have temporary charge of the department during the absence of **H. R. Wakeman**, superintendent, on account of illness.

D. E. Harris, vice-president and manager of sales, Pacific States Electric Company, San Francisco, has left for Portland, Ore., on a general trip through the Northwest territory.

H. D. Randall, Rocky Mountain district manager of the General Electric Company and chairman of the Electrical Cooperative League in Denver, was called to Groton, Conn., by the sudden death of his mother early in March. He will remain in the East several months.

E. M. Breed, sales manager for the Pelton Water Wheel Company, San Francisco, recently returned from an extended business trip to the East, where he visited the principal cities as well as some of the outstanding hydroelectric installations in that part of the country.

B. C. Hill, supervising electrical inspector of Oakland, Calif., recently was installed as president of the Oakland Electric Club. Mr. Hill entered the electrical industry in 1893 as an apprentice with the California Electric Light Company, which later became the Edison Electric Light Company, and the San Francisco Gas and Electric Company, the predecessor of the Pacific Gas and Electric Company. He was with that company for seven years. After working for the Union Iron Works during 1901, he became associated with the Century Electric Construction Company, and after six months was made assistant superintendent. He remained with that firm until 1907, and during four years of that time he was superintending government construction work. In 1907 he became superintendent of the Oakland branch of the company. A year later he accepted a position as superintendent with the Kimball Electric Company in Oakland. In 1911 he took the civil service examination for the office of supervising inspector of Oakland, and he has held that post since that date. Mr. Hill recently was elected vice-president of the California Association of Electrical Inspectors. In addition he is a member of the Western Association of Electrical Inspectors.



B. C. HILL

R. D. Hightshoe and **H. E. Woodring** recently have been added to the sales staff of the Westinghouse department of the Mine & Smelter Supply Company of Denver.

D. T. Lowe, secretary, Denver Credit Association, for a number of years, has been appointed credit manager of the El Paso branch of the Mine & Smelter Supply Company.

Frank Thomas, formerly sales manager, Grays Harbor Railway & Light Company, Aberdeen, Wash., has resigned to become a partner in the electric store of Phillips & Thomas of that city. **H. G. Kelsey** has succeeded Mr. Thomas.

C. E. Devine, formerly of the Sumner Electric Company, Puyallup, Wash., has sold that company to the Parsons Electric Company of the same city. Mr. Devine has signed a three-year contract with the Peterburg Power & Electric Company, Petersburg, Alaska, to become general manager of its hydroelectric plant.

C. A. Pope, advertising manager of the Hendrie & Bolthoff Manufacturing & Supply Company in Denver for a number of years, has resigned to become a free lance advertising specialist. He has opened offices in Denver and will continue to handle his former account along with a number of other electrical accounts.

J. F. McLaughlin, for the past three years general superintendent of lighting and power, El Paso Electric Railway Company, El Paso, Texas, has been appointed manager of the Baton Rouge Electric Company, Baton Rouge, La. He succeeds T. P. Walker, who has been made manager of the El Paso company. Both properties are operated by Stone & Webster, Inc., in whose organization Mr. McLaughlin has held various positions, having been associated with the Blackstone Valley Electric & Gas Company of Pawtucket and Woonsocket, R. I., and the Eastern Texas Electric Company, Beaumont, Texas. Prior to his affiliation with the El Paso Electric Railway Company, he was connected with the rate investigation department of the Boston office of Stone & Webster. While in El Paso Mr. McLaughlin took a prominent part in civic affairs. He was president of the Toltec Club, vice-president of the Social Club, secretary of the Country Club, and an active member of the Rotary Club, of which he was a former director.

J. F. McLAUGHLIN

J. Barclay Naugle, formerly connected witih the Kansas City office of the Naugle Pole & Tie Company, was recently in San Francisco in the interests of his firm. Mr. Naugle in future will handle Pacific Coast sales and will work under the supervision of Walter M. Leavitt, Spokane manager for the company.

A. C. McMicken, commercial manager, Portland Electric Power Company, Portland, has been elected a director of the Portland Advertising Club.

A. E. Wishon, vice-president and general manager, San Joaquin Light & Power Corporation of Fresno, was a recent visitor in San Francisco.

K. E. Clark, second vice-president and general manager, United Electric Company, Canton, Ohio, manufacturers of the Ohio vacuum cleaner, recently visited the Pacific Coast, making a survey of local conditions and establishing the company's new Coast distributors, the Easy Electric Housekeeping Corporation, of which **W. A. Hawley** and **Lee Richards** are the principals.

F. E. Smith, San Francisco representative of the Weston Electrical Instrument Corporation, has tendered his resignation after thirty years of service with that firm.

W. H. Talbott and **Carl W. Wiggins**, superintendents of Electric Meter Department and of Electric Production, respectively, of the San Diego Consolidated Gas & Electric Company, were the San Diego representatives at the recent Technical Section meeting of the P.C.E.A., in Fresno. They reported an unusually profitable meeting.

H. B. Burley, representing the Boston Insulated Wire & Cable Company of Boston, spent some time in San Francisco recently.

H. F. Viot, from 1911 to 1913 in charge of a branch office in Denver for the Shelby Electric Company, Shelby, Ohio, and until recently manager of the Chicago district for the Shelby lamp division of the National Lamp Works of the General Electric Company, has been made general manager of that company's newly created southwestern lamp division.

J. P. Davidson recently has been appointed California representative of the Estate Stove Company, 366 Post Street, San Francisco.

Dr. Thomas Addison, formerly Pacific Coast manager, General Electric Company, has returned to San Francisco after a protracted European tour.

W. H. Kaemper, San Francisco manager for Listenwalter & Gough, recently returned from a business trip to Chicago.

H. B. Brydon, mechanical engineer, Byllesby Engineering & Management Corporation, is a visitor to the Pacific Coast Byllesby properties in connection with the year's construction programs. He was recently in San Diego.

Sam Gates, district manager for the southern California division of the General Electric Company, was a visitor to San Diego early in April.

W. R. Huttinger, vice-president of the Electric Power Equipment Corporation of Philadelphia, is touring the Pacific Coast on his annual two-months trip in the interests of his concern.

F. C. Jones, treasurer of The Okonite Company, Passaic, N. J., recently visited the Pacific Coast, making a survey of business conditions. He was accompanied by **J. L. Phillips**, Western manager of The Okonite Company.

Obituary

L. L. Nunn, president of the Telluride Power Company, Salt Lake City, Utah, one of the pioneers in the development of hydroelectric power in the West, and a philanthropist noted for his educational work, died April 2 in Los Angeles. He was 72 years of age, and until the past few years had been a resident of Utah. Mr. Nunn built one of the early high-tension electric transmission lines, developing a transmission system that carried 40,000 volts from his plant on the Provo River in Utah to the mining camp of Mercur, Utah. He achieved international recognition through his services in engineering and building the first power plant at Niagara Falls for the Ontario Power Company, then the biggest power plant in the world. In pioneering electrical development in Utah and Idaho Mr. Nunn built plants first on the Provo and Logan Rivers, and later at Grace, Idaho, on the Bear River. These plants and the conservation of Beak Lake as a storage reservoir were the nucleus from which has been developed the power which now is supplied to a large part of Utah and Idaho by the Utah Power & Light Company. Other plants built by Mr. Nunn were at Malad, Idaho, on the Madison River in Montana, and at Casper, Wyo. Trained for the legal profession at Harvard University and in German universities, Mr. Nunn became interested in hydroelectric undertakings through his connection with mining operations in Telluride, Colo., where he first began to work out high-voltage transmission. There being at the time virtually no men trained for work of this character, Mr. Nunn began the educational work to which in later years he devoted a great deal of attention and a large part of his considerable fortune. Through organizations formed through Mr. Nunn's efforts at Telluride, Colo., and Deep Springs, Calif., hundreds of men have been given theoretical and practical experience in power work, later finishing their training at Cornell and other institutions of higher learning.

L. L. NUNN

TRADE NOTES

Pittsburgh Piping & Equipment Company, Pittsburgh, Pa., has announced recently the merger of its company with that of the American Foundry & Construction Company of Pittsburgh, continuing to operate under the former name. It has also acquired a new plant, which was completed recently and which it is stated will give unequaled manufacturing and shipping facilities.

Allied Industries, Inc., San Francisco, has been appointed Western agents for Van Cleef Brothers of Chicago. They will carry a complete stock of "Dutch Brand" products for the Pacific Coast demand.

C. M. & J. C. Lengel of the West Coast Agencies have announced the moving of their display room and offices to 330 Winston Street, Los Angeles. The firm specializes in wholesale fixtures.

General Electric Company, Schenectady, N. Y., has announced an average reduction of 10 per cent on standard prices of types of polyphase induction motors in sizes from 1 to 15 hp. and an average reduction of 4 per cent in sizes from 15 to 100 hp.

Weston Electrical Instrument Corporation, Newark, N. J., has made some changes in its Pacific Coast sales policy due to the retirement of F. E. Smith, of San Francisco, the firm's representative for about thirty years. Under the new arrangements three distinct territorial divisions have been made with sales representatives in charge of each. In the north the Weston corporation will be represented by the Western Electric Company with headquarters in Seattle; the San Francisco territory, extending south to Fresno and Bakersfield and across to the state of Nevada, will be handled by J. H. Southard of 682 Mission Street, San Francisco; while the southern California territory and Arizona will be under the sales representation of the "Special Service Sales Company," 502 Delta Building, Los Angeles, whose president is A. A. Barbera. A well equipped and adequate repair laboratory will be conducted in San Francisco at 682 Mission Street by A. Honeychurch.

The Sandoval Sales Company has opened offices at 115 Jessie Street, San Francisco, and will act as manufacturers' agents. The company already has the exclusive distribution of Wesix air heaters, water heaters, thermostats and steam boilers for northern California and Nevada. A Los Angeles office is to be opened shortly to serve as a distribution center for southern California, Arizona and New Mexico. H. E. Sandoval is president and manager of the new company.

Electric Sales-Service Company, Berkeley, Calif., recently has issued a new booklet describing its various types of electric air heaters for homes, offices and apartments. These heaters are known as Therm-Elect.

Roller-Smith Company, New York, recently has issued Bulletin No. 530, containing data concerning two new circuit breaksr which it is introducing.

Master Electric Company, motor manufacturers of Dayton, Ohio, recently have purchased a three-story modern concrete factory building, four smaller auxiliary factory buildings and a strip of land adjoining to allow for future expansions. The new plant was formerly the property of the Davis Sewing Machine Company.

Waage Electric Company, Chicago, is making an interchangeable single-heat cord set under the name "Connectail," which it claims fits most makes of single-heat irons.

Robbins & Myers Company, Springfield, Ohio, has added a new feature to its line for 1925, known as the 10-in. induction type oscillating fan.

Shepard Electric Crane & Hoist Company, Montour Falls, N. Y., recently has issued a comprehensive, fully illustrated catalog. It is descriptive of the floor-operated electric hoists made by the company, and gives complete information regarding capacities, heights of lifts and prices.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, has announced the release of a new publication describing its line of theater lighting control equipment and announcing its multi-preset board. a new Westinghouse development which should be of especial interest to the theatrical industry.

The Monitor Controller Company, Baltimore, has issued recently Bulletin No. 67, describing the Monitor edge-wound resistor. This device is for heavy duty service and is said to possess a number of advantages, which are fully explained in the bulletin just issued.

Century Electric Company, St. Louis, in its Bulletin No. 37, fully describes its complete line of electric fans. The booklet is well illustrated and contains much instructive information on fans.

Waage Electric Company, Los Angeles, is making an interchangeable reflector heater element called the "Replaceall," which it is claimed fits most makes of reflector-type heaters with standard sockets, all that is necessary to replace the burned-out element being to unscrew the old element and screw in the Waage Replaceall.

Truscon Steel Company, Youngstown, Ohio, recently has put on the market a new steel pole, fabricated from copper steel, that contains new features in design, tending to reduce manufacturing costs, according to the announcement.

Mercury Manufacturing Company, Chicago, has issued Bulletin M100 on its "Trackless Train." The bulletin is well illustrated and descriptive of all the interesting features and advantages of the device.

Kingsbury Machine Works of Philadelphia and San Francisco has announced Bulletin E, containing the latest information of the Kingsbury thrust bearings.

Ohio Brass Company, Mansfield, Ohio, has issued a new pamphlet describing its new O-B trolley base. Capacity for the heaviest freight service, yet compactness and flexibility for the lightweight one-man cars, are among the advantages claimed.

Everhot Electric & Manufacturing Company, Los Angeles, has issued recently a manual in the interests of its electric water heaters and electric heaters, that is now available for distribution to anyone interested.

F. W. Wakefield Brass Company, Vermilion, Ohio, has announced a new type of fixture which attaches to any ceiling fan and gives safe support to lamp and globe. It is described in the new Wakefield data sheets now ready for distribution.

Sangamo Electric Company, Springfield, Ill., recently has developed a three-element, three-phase motor for accurate metering on four-wire, three-phase circuits where both unbalanced voltages and currents are likely to exist.

Bakelite Corporation, New York City, recently has announced the publication of a series of bulletins containing information on the use of Bakelite.

The West shines even at a district sales managers' conference held at such far eastern points as Hartford, Conn. Just look at the Smiles Club representative, George A. Gray of George A. Gray Company, San Francisco who is in the second row at the right just under the porch light. Mr. Gray went East recently to gather latest information regarding one of his lines at the sales conference of the American Wiremold Company, held at Hartford, March 3-6. D. Hayes Murphy, president of the manufacturing company is standing in the front row on Mrs. Murphy's right.

A McGraw-Hill Publication
San Francisco, Calif.

N. E. L. A. Convention
San Francisco—June 15-19

May 1, 1925
25 Cents

Journal of Electricity

Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES

Journal of Electricity entered as second class matter February 17, 1921, at the post office at San Francisco, under the Act of Congress, March 3, 1879.
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An Admonition and Some Advice

WITH the convention of the National Electric Light Association six weeks ahead, the hotel committee has received in excess of one thousand registrations. By far the greatest majority of these are from the East, which inclines us to issue a word of warning and a challenge to men in the electrical fraternity in the West.

The forty-eighth convention of the N.E.L.A. is the most important thing that has happened in the West electrically in the past five years. For this reason it is highly important that the West itself be one hundred per cent represented at the meetings. The industry in this section has a message that it must give to the Eastern visitors. It will also profit from the message which the Easterners themselves will bring. Aside from this the West is the host at this gathering, and as such it must be on hand in force.

Expectations are that the convention will be attended by four or five thousand leaders in the industry, over half of whom will be from east of the Rocky Mountains. These are the men who have sent in their hotel reservations. Western men should have settled in their own minds whether or not they can attend the convention. The hotel committee urges that they make this decision final by sending in their reservations. While space in three or four leading hotels in the city will be consumed largely in accommodating the Eastern visitors, there are many hotels in the city just as modern and just as comfortable. Those in charge of the convention want no one to stay away through fear of not being accommodated. Send in your reservations at once. You may rest assured that you will be accorded the best the city can provide.

EDITORIAL

The Electragist's Policy of Distribution

"THAT there may be no question concerning the attitude of the Association of Electragists, International, your executive committee on March 17 unanimously agreed that the only trade policy that can be justified as economically sound is that the distribution of electrical merchandise should be from manufacturer through jobber to contractor and dealer to consumer."

These are the words of Joseph A. Fowler, president of the Association of Electragists, International, and voice the judgment of the executive committee as expressed by resolution on the date above written.

There can be no question as to the soundness of this policy, nor can there be any question as to the desirability of having a definite statement as to that policy, clear, concise and to the point. It is axiomatic that before one may proceed to the solution of a problem it is essential first to state the hypothesis. Here, then, is the hypothesis. Now comes the problem—how may this trade policy be made effective?

There are some manufacturers who sell direct to consumers, some jobbers who do the same. There is the so-called "courtesy" discount, and many other trade evils that have sprung up like weeds in the garden of the electrical industry to the disadvantage of the distribution structure and the creation therein of a condition of disorderliness that makes for irresponsibility and unsatisfactory service to the consumer.

It is idle to preach abstract business morality. Reform of bad practices must be brought about through contact with the pocket nerve. The task that lies before the industry consists in translating the policy outlined by Mr. Fowler into terms of its beneficial effect upon the pockets of those who abide by its provisions. If the manufacturer, or jobber or contractor-dealer can be shown that every time he attempts to by-pass the established channels of distribution he is sacrificing his own interests and those of his fellows for the sake of a temporary advantage, there is a new era ahead of the electrical industry.

The first step, so far as the West is concerned, would appear to be the passage of resolutions indorsing the Electragists' trade policy by electrical organizations wherever possible, and the distribution of such resolutions among the membership. The California Electrical Bureau, the Pacific Coast Electrical Association, the Pacific Coast Jobbers' Association, and the various electric leagues and clubs might well make this a part of their order of business at forthcoming meetings. Such resolutions as expressions of the organized electrical industry should go far toward bringing about an intelligent conception on the part of the individual that his best interests would be served by a conscientious adherence to this policy.

However, there is another angle to the question. The Pacific Coast probably approaches more closely to the actual practice of this policy than any other section of the country for several reasons. We are located geographically a long way from the great manufacturing centers, and our metropolitan districts are fewer in number. This lessens to a marked degree the problems of close contact among the various branches of the industry. There is a peculiar bond of craft fellowship which permeates the whole industry, and, as friendship is the greatest eliminator of business friction, we are in a much happier position than some other parts of the country.

The industry must not pat itself on the back, however, and say, "We should worry about the other fellow's problems." The gap between the East and the West is slowly but surely closing. Great mergers are taking place, and Eastern capital is looking to the Pacific Coast as a favorable place for investments. As more and more Eastern capital comes in, there must come a better understanding of common problems and a closer bond of fellowship and cooperation.

In backing up the Electragists on their policy of distribution the West is afforded an opportunity of dropping its self-sufficient attitude, and through its contacts with our national organizations to bring to bear its combined thought and influence to the end that rather than a group of separate units the electrical industry may take its place as the greatest in the country.

This is a task worthy of the metal of our best thinkers and hardest workers. The West always has been to the forefront in electrical developments. Is there any reason why it should not take the lead in an endeavor to bring about a closer understanding nationally among the various branches of the industry? And this not for personal glorification and not alone for the benefit of other parts of the country, but for the continued security and improved conditions of the happy business relationships we enjoy today.

For Utility Executives of the Northwest

AMONG the comments made on the successful meeting of the Technical Section of the Northwest Electric Light and Power Association recently held at Spokane was one to the effect that if the executives of the member companies realized more fully the value to the companies of the work undertaken by this important section, more time could be obtained to hold such a meeting and a greater good would result from a more complete discussion of the subjects presented. This thought was voiced in the meeting, and while we do not aspire to the self-appointed task of mentor in the circumstance, nevertheless we do not refrain from comment.

The record attendance of 120 delegates and visitors, or an increase of 38 per cent over the attendance at last year's meeting, which was the first of its kind, speaks volumes for the prestige that the meeting has attained in one year. When it is realized that many of those attending were not, strictly speaking, participants, but rather were interested listeners from some branch or other of the electrical industry, eager to learn, anxious to keep pace with the latest engineering thought as developed by central-station practice, that statement becomes the more convincing.

A resume of the proceedings of this meeting is published elsewhere in this issue. We challenge to a cursory perusal of this resume those who may claim to have little interest in technical affairs, those who perhaps may think of the engineer as a necessary evil. We ask them to note how many references are made to the relation of the work of the Technical Section to other sections perhaps thought to be more important. We invite attention to the volume of pure and unadulterated economics delved into by the participants in the discussions—the dollar-and-cents application of technical theory to the practical job of operating a power system. If there was one subject among those presented that did not contribute much to the wealth of knowledge demanded of those entrusted with the job of keeping down investment or maintenance or operation costs, of operating efficiently and safely any part of the system, of giving satisfactory service to customers, then our judgment is wrong. If any such man came away from that meeting without having sensed the opportunity to make himself a better man in his job, then this editorial is idle chatter and we have wasted space.

Electricity Finds a New Use in the Food Industry

WORD has been received from Melbourne, Australia, that electricity is being successfully employed for defrosting meat. Frozen carcasses taken from cold storage warehouses at temperatures of 5 deg. F. are raised to 40 deg. F. in a very few minutes as a result of the new process. The system employed is exceedingly simple. Current is passed through the carcass by means of steel electrodes at the head and tail. When the temperature reaches 40 deg. the current automatically is shut off. The condition of the meat after defrosting is said to be almost perfect, the meat being similar in appearance to freshly killed carcasses, with no trace of sweat or flabbiness. With the processes formerly employed the time required to defrost a carcass ranged from seven to thirteen hours, depending upon the animal in question. The meat also showed traces of having been kept in cold storage, notably in its flabbiness and sweaty appearance.

This announcement adds one more application of electricity to the long list of its uses in the preparation of food products. It already furnishes motive power for operating precooling and refrigerating plants. It is being employed successfully in the dehydration of fruits, nuts, vegetables and even eggs. There are few processes in the growing, harvesting, preserving and preparation of the food we eat that electricity does not enter into. As time goes on there will be other even more important applications of electric energy in the food industries.

Success of June Bride Campaign Rests with the Industry

THE California Electrical Bureau has perfected plans for a bigger and better June Bride electric appliance campaign for 1925. On another page of this issue the details for this year's sales drive are outlined. There are several radical changes. Instead of a June Bride Week, the campaign will continue over a period of six weeks so that the industry may capitalize to the fullest extent upon the custom of presenting the June bride with suitable wedding gifts.

The importance of this campaign to the industry cannot be overemphasized. Such an opportunity for increasing appliance sales comes but twice each year, at Christmas and in June.

It is the duty of the industry to see that the campaign is successful. The Electrical Bureau can only initiate such movements. It cannot be responsible for their success. It prepares and distributes the sales and window display material. The burden of using the material to greatest advantage rests with the jobber, the contractor-dealer and the appliance shop. The Bureau writes the play and furnishes the "props." The industry must furnish the actors.

A Mistake or A Challenge

MUCH talk is devoted to truth in advertising, and one of the chief reasons for the existence of the Better Business Bureau is to see that merchants do not make untruthful or misleading statements regarding their products through the public press. Occasionally, however, unwitting misrepresentations appear in advertising copy in spite of all precautions. The accompanying advertisement is an example of the misguided efforts of an ignorant copy writer.

The advertisement itself is one of a series being run in the newspapers of a large Western city by a wholesale grocery. When the attention of the advertising agency which prepared the copy was called

to the obvious mistakes, error was admitted in the case of the hybrid percolator but not in the case of the (in)convenience outlet. The agency claimed that 85 per cent of the women using electric percolators connect them in this fashion and that only three out of ten coffee utensils are electric. Under the circumstances they held that to present an illustration depicting the housewife in any other pose would be misrepresentation.

If the statements of the advertising agency are correct, then the electrical industry is at fault. If not, then the advertisement is an excellent sales argument for the contractor-dealer or central station engaged in selling better wiring and more convenience outlets. At any rate we feel that the advertiser in this particular case has not kept the standard of his illustration up to the quality of the product he is advertising. Let the electrical industry cooperate with other industries to prevent such mistakes from recurring.

DISCUSSION

Los Angeles Electric Club Pays Tribute to the Memory of J. A. Lighthipe

To the Editor:

Sir—The Electric Club of Los Angeles had planned to have the late James A. Lighthipe conduct one of its meetings in the near future. Failing in the realization of these plans, they devoted a large part of the regular meeting of April 20 to a review of the contributions of Mr. Lighthipe to the engineering advancement of the electrical industry. Comments brought forth at this meeting showed the deep feeling held for him by all of his former associates and acquaintances.

Of all of the tributes which have been paid to Mr. Lighthipe, I believe that the following, which appeared in the April 20 issue of "Sparks," the official organ of the Electric Club, is the most appropriate:

James Alfred Lighthipe
AN APPRECIATION

"It is easy in the world to live after the world's opinions; it is easy in solitude to live after our own; but the great man is he who in the midst of the crowd keeps with perfect sweetness the independence of solitude."

Such a man has passed from our midst. He will be missed sincerely by all true men. He was a rare combination of scientist and practical engineer—a pioneer with the thoughts of an idealist, yet never losing sight of the practical considerations of his profession.

But it was the kindly humanity of the man that lent to the charm of his personality. He was unspoiled by honors that were accorded to him and he enjoyed the successes of his fellowmen even more than his own. His character and goodness still live with us.

"There was—there is no stronger, manlier man."

H. E. BARDEN,
Southern California Edison Company.
Los Angeles, April 22, 1925.

Reader Contends Engineers Have Equal Chance with Lawyers as Executives

To the Editor:

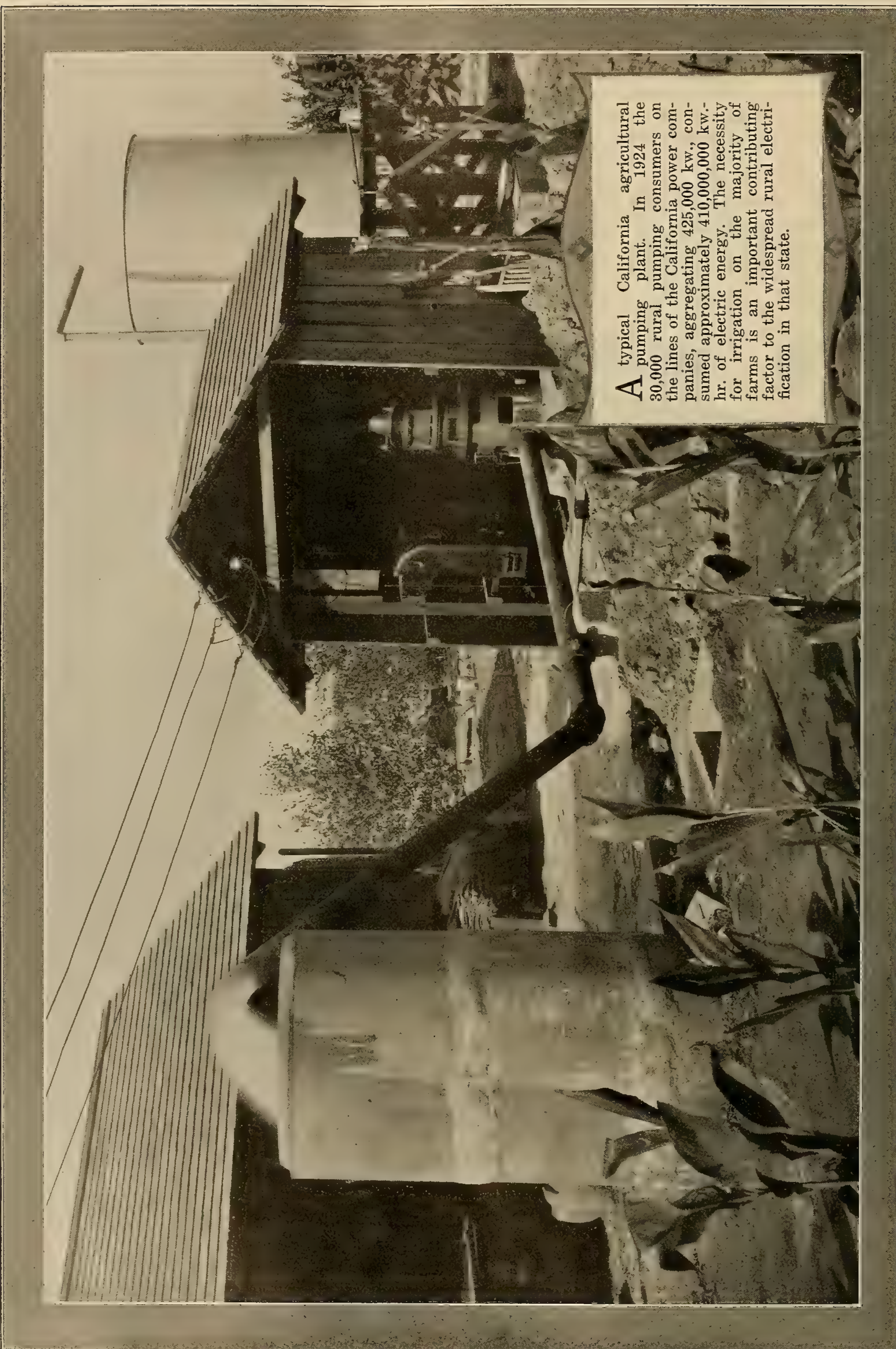
Sir—After perusal of the editorial in the April 1 issue entitled "Specialization and the Executive of the Future" it seems to me that it would be impossible for engineers to finish its reading without saying to themselves, "Oh, what's the use," or words to that effect. To those who may have been so tempted I would like to say for their consolation that there are striking cases in recent history where executives were not trained to be lawyers at college.

I have in mind the case of Eugene G. Grace, president of the Bethlehem Steel Corporation, whom I have the pleasure of calling classmate and friend. Mr. Grace graduated from Lehigh University, Bethlehem, Pa., as an electrical engineer, and I remember the day we received our sheepskins I said to him, "Gene, have you a job yet?" and he replied, "No, and I don't know just where to look for one." A few days after this I heard he had accepted a position with the Bethlehem Steel Corporation in their electrical department, such as it was in the early years of this century. Five years later, when we met at a class reunion, he was general superintendent, at the ten-year reunion he was general manager, and after twelve years was president of that corporation, and I have it straight the end is not yet. Mr. Schwab must have confidence in engineering training.

Mr. Grace was an honor man in my class—not only in his studies but in every activity of college. Among other things he featured baseball through his entire four years and was captain of the varsity team three years. I am sure that every one of his classmates is proud and happy to see him so successful.

If any budding engineer can take hope from this biography I will feel I have contributed something to their salvation and peace of mind.

CHAS. M. MASSON,
Southern California Edison Company.
Los Angeles, Calif.
April 13, 1925.



A typical California agricultural pumping plant. In 1924 the 30,000 rural pumping consumers on the lines of the California power companies, aggregating 425,000 kw., consumed approximately 410,000,000 kw.-hr. of electric energy. The necessity for irrigation on the majority of farms is an important contributing factor to the widespread rural electrification in that state.

The White Bluffs-Hanford Land Settlement Experiment

By H. W. Cooper
District Manager, Pacific Power & Light Company, Pasco, Wash.

LAND settlement schemes, involving state or district financial aid in development, have met with varying degrees of success. One of the newest of such schemes in the Northwest is described by a man whose company had much to do with the solution of the irrigation problem involved. Incidentally the project bids fair to be altogether successful.

BY an act of the legislature of the State of Washington in 1919, and a subsequent revision of the act, an appropriation of approximately $500,000 was made from the reclamation revolving fund for land settlement for the purpose of acquiring, developing and settling the White Bluffs-Hanford Land Settlement Project. This project had a double purpose: first, to reclaim arid lands, and second, to extend credit and opportunity to war veterans of the state. By the reclamation of its arid lands the state not only lays the foundation for increasing its industrial population, but also enhances the value of its natural resources, and in searching for an equitable compensation for the war veteran the idea of helping him to become self-supporting on his own land was carried out through this plan of "Soldier Settlement."

Location of Project and Conditions of Settlement

In selecting a site for this project the state chose some land between White Bluffs and Hanford, Wash., on the Columbia River about 50 miles north of Pasco and 20 miles east of Priest Rapids. Here the unimproved land is comparatively cheap, the soil is such that a variety of crops can be raised successfully with the aid of water, and abundant water is available in most spots a short distance below the surface of the ground. In this general district, the state in 1922, under the provisions of the original act, acquired by purchase 1,160 acres, dividing this land into 58 tracts of 20 acres each. In 1924, when the original act was extended by law, 840 additional acres were purchased, or enough for 42 more tracts, so that now the project contains 100 twenty-acre tracts. These tracts are not geographically contiguous but lie in scattered groups of from five to ten tracts each, since the lands purchased were those that were available, due regard being given to the topography for irrigation, the availability of water, and the fertility of the soil, rather than to their geographic situation.

In order to make the project economically successful, each applicant was required to have certain qualifications: first, that he be an ex-service man; second, that he be experienced in farming to some degree; and third, that he have at least $1,500 or its equivalent. To facilitate the prompt settlement of the project, the first qualification was modified recently to admit civilian settlers. This modification was made with the sanction of the executive committee of the State Department of the American Legion, which, realizing that colonization of the project was proceeding too slowly, requested the state to hold it open no longer to ex-service men exclusively. The reason for the second qualification is that, since both the settler and the state make material investments in the tract, it is desirable that the settler know something about farming. As to the third qualification, part of the $1,500 required of the settler must be paid to the state as the initial payment on the tract he selects, and the balance constitutes an amount thought sufficient for living expenses during the early development of the tract.

J. C. Scott, formerly county agent of Franklin County, Wash., who is in charge of the project with an office in White Bluffs, not only manages the project generally but also assists each settler in solving his many farming problems. Through his knowledge of experimental and practical agriculture he has been able to help many settlers get a good start on their farms.

Irrigation Problem

Among the first considerations by the state in preparing the tracts for settlement was that of the problem of irrigation. After deliberation it was decided to dig a well on each tract, provide an individual pumping unit, and let each owner control his own use of water. In connection with the consideration of the kind of motive power for the pumping units, the state approached the Pacific Power & Light Company, which was serving other ranches in that vicinity with irrigation power. After negotiations had been completed, the company had agreed to run the necessary distribution lines with transformers and secondaries to operate the pump motors, and the state had agreed to guarantee for six years a revenue of $35 per hp.-yr. of installed capacity.

The first investment made by the state after purchase of the land was in test wells dug on each tract to discover the adequacy of the water supply. Dur-

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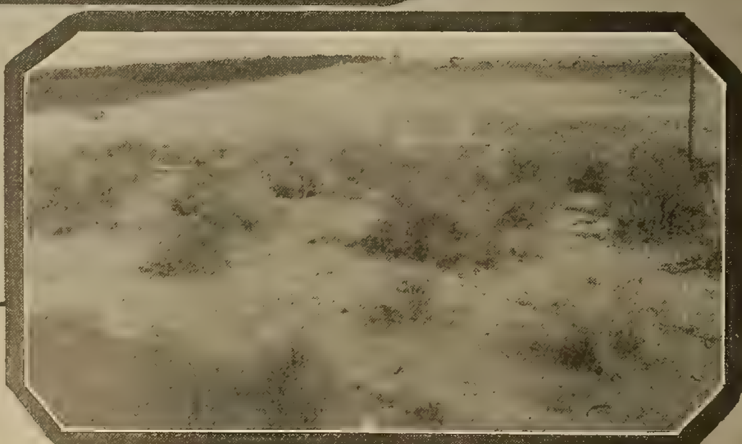

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TYPICAL scenes on the White Bluffs-Hanford land settlement project, where electricity does much to aid the farmers. In views 1 and 2 average conditions on the farm are depicted, and in 3 a field of alfalfa, electrically irrigated, is shown. The land settlement office is located at White Bluffs (4) and is open to all settlers. In the foreground in 5 the general character of the land before cultivation is shown.

ing this period of experimentation the company ran its lines and connected to the pumping equipment in each test well, the state agreeing to pay the cost of moving any line and equipment in case it was found necessary to abandon any particular tract on account of lack of water. In a few instances it was found advantageous to combine the best parts of two adjoining tracts into one tract, discarding that part of each found to be unsuitable for cultivation or uneconomical to water. In the final installation there is installed on each tract a De Laval pump direct-connected to a General Electric Company motor, the sizes of which run from 3 to 10 hp., according to the amount of water required and the height of the lift. This equipment, which was installed by the A. B. Fosseen Company, Yakima, Wash., under the direction of Eck Baughn and W. H. McMurray, has proved satisfactory, and only in a few cases has it been necessary to increase the size of the motor originally installed.

Investment and Revenue of the Power Company

The irrigation load as it stands at present consists of four 10-hp. motors, seventeen 7½-hp. motors, and seven 3-hp. motors, making a total of 102 motors with a total connected load of 558½ hp. The apparent discrepancy between the number of motors and the number of tracts is accounted for by the fact that some tracts have more than one motor. Under the agreement between the state and the company, the state pays annually about $19,500, and the company made extensions aggregating approximately 25 miles of 6,600-volt distribution lines with the necessary transformers, secondaries, services and meters, at a total cost of slightly less than $46,500.

This arrangement between the state and the company has proved to be reasonably satisfactory. When it is realized that the investment in distribution lines of the Pacific Power & Light Company is about 30 per cent of the total investment in plant, it may be seen that this investment of $46,500 represents a total investment in plant of over $150,000. Therefore it may be assumed that the state is relieved of the necessitiy of making a considerable investment in irrigation facilities for the project, that would have been necessary under any other scheme of electric pumping without the cooperation of a utility company. From the standpoint of the company, the revenue of $19,500 is somewhat less than would be required for a similar investment under the line-extension rules of the State Department of Public Works, but if the project is successful, so that approximately the same revenue is received from it for a number of years after the expiration of the guarantee period, the business will prove to be profitable; and, too, the revenue from domestic power and light will serve to augument this amount from the beginning. Of course the company was actuated largely by a desire to cooperate in a public enterprise, and the success of the project will tend to encourage other development in the same general district, which will inure to the benefit of the company.

On each tract there has been constructed a three-room plastered cottage with built-in features, including cooling closet in the kitchen, wiring for electric lights, an 8x12-ft. back porch, ample front porch, and a 9x9-ft. cellar with concrete walls. There has been constructed also on the tract a combination barn and cow shed, occupying a space 16x30 ft., and a small modern poultry house. These buildings will house two horses, two cows and 100 chickens. All buildings have been erected on concrete foundations and are painted attractively. In instances where the prospective settler has additional funds a deviation from this uniform building plan may be made.

State Aid to the Settlers

The settler, having first made the necessary application and been accepted, is required to move onto the tract within six months and must live on it at least eight months of each year. If desired, the state will furnish financial assistance for certain improvements such as clearing, leveling and seeding the tract, rabbit-proof fencing, flumes for irrigation distributing systems, and, in addition, will pay the electric power bill for pumping for the first three years. Recent legislation in connection with the project permits the state to buy cows for the settlers whenever application is made, provided, however, that the settler has sufficient feed for such stock. Under the provisions of this law the settler repays the state at the rate of $5 per month per cow plus six per cent interest on the unpaid balance.

The total investment by the state in lands, buildings, improvements and power bills, in cases in which the settler has elected to accept all the financial aid available, amounts approximately to $5,000 per tract. To repay this the settler must make an initial payment of $612.50. During the next three years he is required to pay only four per cent interest on the unpaid balance, and after this so-called development period he amortizes this balance by an annual payment equal to $7.36 for each $100 owed. This will pay the annual interest and discharge the principal in twenty years.

Of the total of 100 tracts fifty have already been colonized and developed in whole or in part, and a number of prospective buyers are expected to sign up this year (1925). The settlers now on the tracts plan to devote about one-half of their acreage to feed for dairy cows, hogs and chickens, and the remainder to early fruit and vegetables. Since the territory is favorably located with respect to markets, has an average growing season of 204 days, and, according to government reports, matures crops earlier than any other locality in Washington, it would seem that the project has the best of chances to work out successfully. Some of the first settlers have made material headway in placing their tracts under cultivation, even in the face of adverse agricultural conditioins in 1922 and 1923. A great diversity of products has been raised successfully during the first two years, and the addition of stock and poultry has aided materially in stabilizing the income from these tracts. It is expected that the project will be under complete cultivation in a few years.

The South San Francisco plant of the Pacific Coast Steel Company

Electricity Simplifies Operation of a Modern Steel Mill

By C. H. Tallant
Pacific Coast Steel Company, San Francisco

ELECTRIC power plays an important role in the manufacture and fabrication of steel on the Pacfic Coast. In the plant described in this article the total motor load is 8,200 hp. and the annual power consumption 8,910,000 kw-hr. Hydroelectric power will play an increasingly important part as the steel industry of the West develops to meet the demands of this territory for a local product.

WHILE the various operations of a modern steel mill are somewhat complicated, electric power and lighting have contributed largely to simplifying its operation. The term "mill" in this sense is to be understood as applying to the entire plant. In reality a steel mill is composed of different units each designed to fulfill certain necessary functions in the manufacture of the steel products. In all of its operations the use of electric power is indispensable.

The South San Francisco mill of the Pacific Coast Steel Company is a typical example. Open hearth steel is manufactured in the open hearth department from scrap and pig iron and is cast into ingots for rolling on the 24-in. and 18-in. mills. This rolling shapes the ingots into a variety of finished sections, such as angels, bars, rods and bands or into billets for final rolling in the smaller mills of the plant. These finished sections then either are supplied to the trade, as such, or are fabricated into structures of various kinds by the tower department. This one plant with a capacity of 180,000 tons of steel per year, has a connected motor load of 8,200 hp. and a lighting and heating load of 150 kw. The three plants of the company, including the one at South San Francisco, have a total motor load of well over 20,000 hp. The 1924 total consumption at the South San Francisco plant was 8,910,000 kw-hr., with a maximum half-hour average demand of 3,840 kw. Power is supplied from the South San Francisco substation in three circuits, through three 2,250-kva., 60-kv./2.3-kv. transformers connected star-delta. The load is very completely metered because of its fluctuations, indicating and integrating watthour meters, maximum demand meters, voltmeters and ammeters being used. Circuits No. 1 and No. 2 are both wired in duplicate from the substation as a protection against

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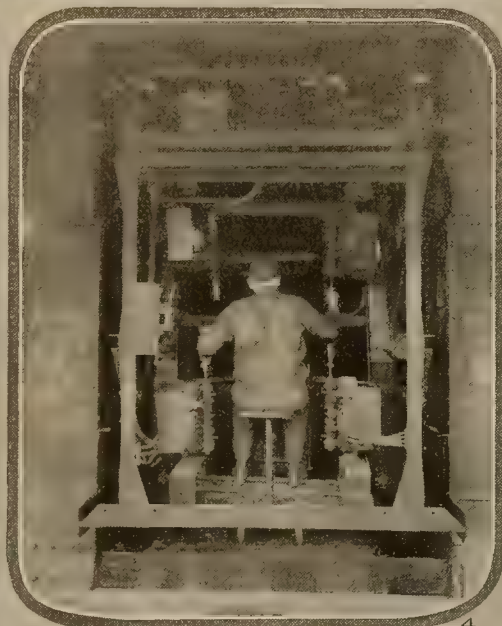

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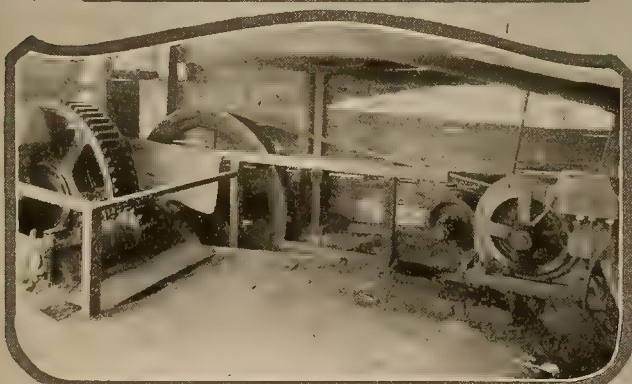

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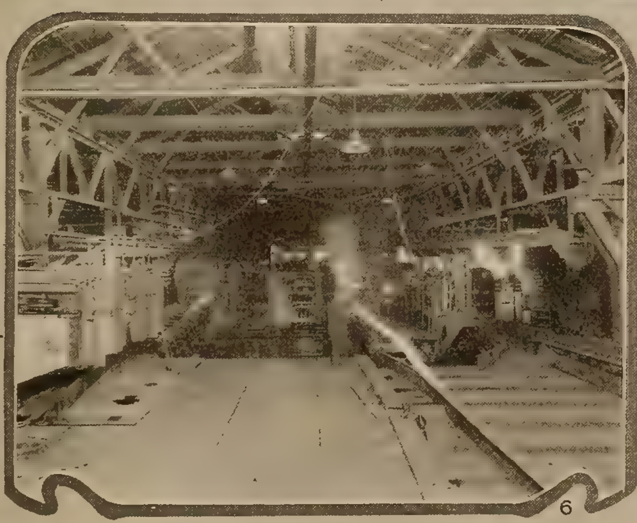

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AT the South San Francisco plant of the Pacific Coast Steel Company, electricity plays an important part in the manufacture and fabrication of steel. Photo No. 1 shows the substation which serves the 8,200-hp. connected load of the mill. No. 2 is a view of the ingot storage yard with an electro-magnet equipped crane stacking ingots. No. 3 shows the pit of the open hearth furnace building with a 75-ton crane carrying the pouring ladle. No. 4 shows the operator seated in the cab of the electrically driven charging machine. Four motors with an intricate control system make this machine almost human. No. 5 shows a 35-hp. motor driving the alligator shears which cut rails and heavy pieces of scrap into required length for the furnaces. No. 6 shows the 22-in. and 18-in. rolling mills in action with ingots on two of the electrically driven tables. At the right is some of the operating mechanism.

line trouble between substation and the load. They run out on the same pole line. Circuit No. 3, feeding the tower plant and pumping station, is a single circuit coming out on a separate line.

On the Pacific Coast, open hearth steel is made from scrap, such as discarded structurel steel, railroad rails, car wheels, oil well cable, castings, machine shop turnings and punchings and pig iron. This requires extensive storage space for the scrap supply at each mill. The main scrap yard at South San Francisco, immediately in front of the open hearth furnace buildings, contains 35,000 tons of scrap, on the average, and occupies an area 650 ft. long by 80 ft. wide.

Scrap Yard Equipment

A standard gage spur track runs the full length of the yard so that scrap may be unloaded at any point. A narrow gage line also runs through the yard and into the open hearth building and is used to convey the scrap to the furnaces. Two overhead traveling cranes, each equipped with a lifting magnet, are used in unloading the cars of scrap and also for loading the small charging boxes with material for the furnaces. These charging boxes are conveyed on small flat cars on the narrow gage track. Manual handling of the scrap is used only to a limited extent and then chiefly for cleaning up odds and ends.

Reserve supplies of scrap are maintained in several smaller scrap yards on the property. The material in these yards is handled by a locomotive crane equipped with a lifting magnet.

The length of material to be charged into the furnaces is limited to approximately 5 ft. Longer pieces such as rails are cut at the mill by cutters known as alligator shears, these shears being individually driven by electric motors. The movement of the shears is continuous, and scrap is fed into position with the upstroke of the cutting head. The cutting head of the rail shears, weighing 10 tons, makes 16 strokes per minute while the smaller shears operate at higher speeds.

Use also is made of the electric motors in preparing other materials for the charging operation, such as crushing the dolomite, fluorspar and corrective ores.

The Electric Charging Machine

Probably the most ingenious of all the electric equipment in the mill is the charging machine itself, which charges the loads of scrap and other materials into the furnaces. Control of the four motors on the machine is through individual manually operated controllers, and when charging, the operator has his hands full. One motor drives the machine along its tracks; the other three motors are geared to the loading plunger for its three movements, forward and back, up and down and revolving. This plunger engages a loaded charging box, raises it and carries it forward into the furnace, dumps it and returns it to the car and then pushes the train of cars along to place the next charging box in position in front of the furnace door.

Electric power is used entirely in handling material on the other side of the furnaces, one 75-ton, one 60-ton and two smaller overhead cranes being in constant service over the pit. Ingot molds are set in place, loaded and empty ladles are moved, molds are stripped from the ingots, and even the flat cars coming into the pit are pulled along by the cranes.

Ingot-Handling Process

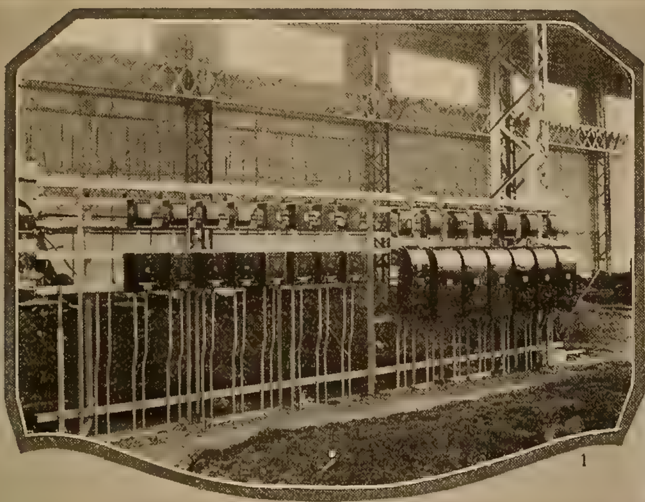
From the open hearth building the ingots are moved into the ingot storage yard. A crane equipped with a lifting magnet is used to raise the ingots from the cars and carry them to designated spots for stacking, according to their analyses and respective heat numbers, or to the charging end of the reheating furnace. Here the ingots are charged into the furnace by an electrically driven pusher, and move along on water-cooled skid pipes in their passage through the furnace. The water for these pipes is supplied from the main pumping plant, under pressure, and must come in a steady stream. If the water should be shut off even for an instant, the pipes would be burnt out and the mill operation forced to suspend until replacements could be made. In the pumping plant three centrifugal pumps, driven by individual motors, are depended on for the bulk of the water supply of the whole mill. After slowly moving through the reheating furnace, the ingots emerge from the working end of the furnace and are carried on a roller conveyor into the rolling mill.

Here the heavy work of electric power in the mill starts. The ingots first pass through the 24-in. mill to be reduced in size to billets. They are then passed through the 18-in. mill for rolling into heavy sections, or into the billet shears for cutting and rolling in the smaller rolls. The stands of rolls of the 22-in. and 18-in. mills are in alignment, but each is driven by its own motor through gears. The 24-in. mill motor is an 800-hp., 195-r.p.m. induction motor and that for the 18-in. mill an 1,800-hp., 593-r.p.m. motor, both operating at 2,300 volts.

Four electrically operated carriages or tables handle the steel as it moves through the rolls. These carriages, approximately 25 ft. in length, have complete electric motor and control equipment. They move along tracks parallel to the stands, tilt up and down to receive or eject the steel, and move the steel back and forth on rolls. Each carriage is equipped with a separate motor for each function and is run by an operator seated in a cab on the carriage. Control of the motors is through separate controllers.

Motor Equipment of Smaller Mills

The loads of the smaller stands of rolls are approximately equal to that of the 24-in. mill, but the elaborate handling equipment is not necessary. Eight hundred hp., 2,300-volt motors of 184½ r.p.m. and 272 r.p.m., respectively, drive the stands of rolls of the 10-in. and 9-in. mills. As in the larger mills, roller conveyors feed the steel to and away from the rolls, and each of these is electrically driven. Separate reheating furnaces are used to reheat the billets for the smaller mills, and they also are charged by electrically driven pushers.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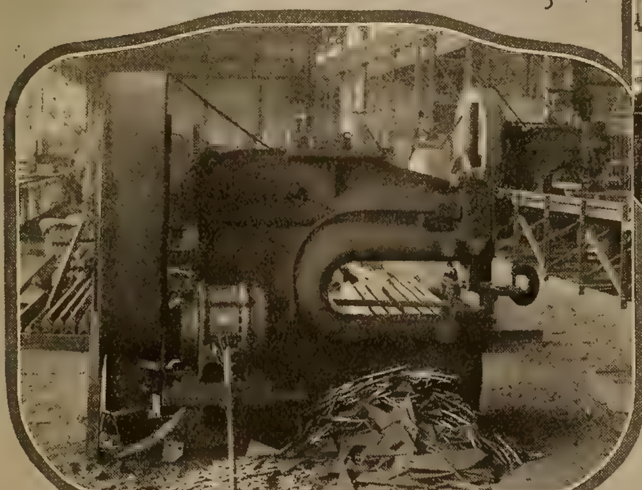
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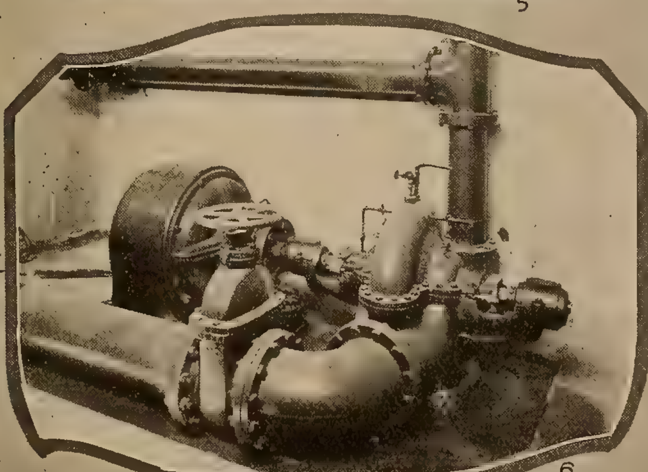
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MOTORS of all sizes are used in the South San Francisco plant of the Pacific Coast Steel Company. No. 1 shows an auxiliary switch and contactor panel in the tower department with protecting housing removed. Each motor has push-button control. No. 2 is a view of the 800-hp. motor driving the 9-in. mill. The control equipment is shown at the left. No. 3 is a view of the storage yard with the electrically driven gantry crane. No. 4 shows the compressor room with a 225-hp. induction motor in the foreground driving one compressor and a 265-hp. synchronous motor direct-connected to a compressor in the background. No. 5 is a typical installation of individual motor drive and push button control in the tower shop. The machine is a plate shear. No. 6 shows a 150-hp. motor direct-connected to a centrifugal pump in the main pumping building.

From the rolls, the finished sections go to "hot beds," where they are cooled, cut to length and straightened, ready for warehousing. All of the conveying, cutting and straightening is done by electric power.

Alterations to Increase Mill Capacity

Extensive alterations in the motor and control equipment of the present 10-in. mill are under way and when completed will greatly increase the tonnage capacity and the range of rolled sizes. This mill will be a combination "Belgian mill," consisting of a 16-in. roughing mill and a 10-in. finish mill, driven by separate motors. The roughing mill is for breaking down the ingots into billets of workable size for the 10-in. mill and is driven by a 750-hp. slip-ring induction motor with full magnetic control and current limit acceleration. The 10-in. finishing mill motor is a double-speed range motor with full Scherbius control and is direct-connected to the main shaft of the mill. It is a constant torque motor developing 1,500 hp. at the top speed of 320 r.p.m. and 900 hp. at the minimum speed of 200 r.p.m. The head roller has complete control of the motor through push buttons located at his station. This installation is the first of its kind in Western steel mills and is a decided improvement over the older types.

Extensive use is made of overhead cranes in each of the rolling mill buildings. All handling of rolled sections after they are prepared for warehousing is by this means, as well as are the lifting and conveying of parts in repair work. Direct current for all of the cranes and for the direct-current motors in the conveying tables and roller conveyors is supplied by two motor-generator sets. A 300-hp. and a 225-hp. motor, respectively, drive a 200-kw. and a 150-kw., 250-volt generator, the generators being operated in parallel.

The Tower Shop

The tower shop, in which all of the fabricating and galvanizing is done, is located some distance away from the rolling mill group of buildings. Stock for the tower shop is moved over a standard gage railway and enters the tower building at the upper end. From this point until it is on the cars, for shipment, the material is handled entirely by electric power. The building and its equipment, both mechanical and electrical, constitute a fine example of a modern industrial plant. Overhead cranes run the full length of the main building, 500 ft. long, and the galvanizing shop wing, 175 ft. long. One of the main cranes has a monorail suspended from it so that material may be passed directly into the galvanizing wing without duplication of handling.

As stated above, the tower plant is supplied with current at 2,300 volts through circuit No. 3 from the main substation. The stepdown transformers, main switchboard and motor-generator set for crane service are isolated in a lean-to on the south side of the building. Three 220-volt a.c. power circuits, the 240-volt d.c. power circuit, and a 110-volt lighting circuit lead out of this room. Two of the a.c. power circuits run to separate switch and contactor panels and supply power for the machines in the main building. All of these machines are equipped with push-button control, being driven by individual motors. The auxiliary panel boards, equipped with entrance switches, contactors and compensators, are housed in separate lean-tos outside of the main building. They are thus out of the way of operations and easy of access front and rear for adjustments or replacements.

The various shears, punches and similar machines are arranged so that the material moves along to the galvanizing wing as the fabrication progresses. The monorail crane carries it to the pickling vats and from there to the galvanizing kettles. When galvanizing is completed the material is transferred to the 160-ft. gantry crane which operates the full length of the tower yard. This crane spots the finished steel for storage or loads it directly onto freight cars standing on the standard gage spur for shipment to destination.

Power Requirements

The numerous service operations throughout the plant, which are incidental to the main operation of manufacturing, rolling and fabricating the steel, require a substantial amount of power. Among these may be mentioned the following:

Pumping station, with total motor load of 260 hp., supplying water to the rolling mills, shops and other buildings.

Compressor room, total motor load 499 hp., supplying compressed air to the machine shops, furnaces and repair shops.

Hydraulic pump, 25 hp. motor, supplying water under pressure to raise the furnace doors. The intense heat prevents the use of any other form of lifting.

The machine and pattern shops, roll lathe shop, locomotive repair shop and testing laboratories, with a combined motor load of 175 hp., exclusive of overhead cranes.

The accompanying table shows in detail the rating and duty of each of the motors which make up the total load of approximately 8,200 hp.

CONNECTED MOTOR LOAD OF ENTIRE MILL

Department	Hp.	Voltage	Duty
SCRAP YARD	35	220—a.c.	Rail shears
	2-10	220—a.c.	Scrap shears
No. 1 crane	21	240—d.c.	Bridge
	30	240—d.c.	Hoist
	10	240—d.c.	Trolley
No. 2 Crane	30	240—d.c.	Bridge
	30	240—d.c.	Hoist
	10	240—d.c.	Trolley
Ore bins	35	220—a.c.	Crusher
	10	220—a.c.	Crusher
	2-5	220—a.c.	Elevator
	3	220—a.c.	Elevator
OPEN HEARTH No. 1 Charging machine	30	240—d.c.	Bridge
	20	240—d.c.	Hoist
	20	240—d.c.	Trolley
	5	240—d.c.	Revolving
No. 2 Charging machine	30	240—d.c.	Bridge
	20	240—d.c.	Hoist
	20	240—d.c.	Trolley
	5	240—d.c.	Revolving
No. 6 Furnace	7½	220—a.c.	Reversing valve
75-ton ladle crane	50	240—d.c.	Bridge
	30	240—d.c.	Main hoist
	18	240—d.c.	Auxiliary hoist
	18	240—d.c.	Main trolley
	10	240—d.c.	Auxiliary trolley

Department	Hp.	Voltage	Duty
60-ton ladle crane	30	240—d.c.	Bridge
	40	240—d.c.	Main hoist
	30	240—d.c.	Auxiliary hoist
	15	240—d.c.	Trolley
No. 1 Stripping crane	25	240—d.c.	Bridge
	30	240—d.c.	Hoist
	7½	240—d.c.	Trolley
No. 2 Stripping crane	14	240—d.c.	Bridge
	50	240—d.c.	Hoist
	7½	240—d.c.	Trolley
	7½	220—a.c.	Ingot stripper
INGOT YARD 7½-ton crane	30	240—d.c.	Bridge
	30	240—d.c.	Hoist
	7½	240—d.c.	Trolley
ROLLING MILL 24-in. mill	800	2,300—a.c.	Main drive
	50	220—a.c.	Hot shears
No. 1 Table	3-30	240—d.c.	Table operation
	5	240—d.c.	Manipulator
No. 2 Table	3-30	240—d.c.	Table operation
Reheating furnace	30	240—d.c.	Roller conveyor
	2-21	240—d.c.	Pusher-in
	18	240—d.c.	Pusher-out
	14	240—d.c.	Pusher-out
18-in. Mill	1,800	2,300—a.c.	Main drive
	2-10	220—a.c.	Tables
	2-25	220—a.c.	Auxiliary roller
	35	220—a.c.	Crop end saw
	2-10	220—a.c.	Transfer chair
	10	220—a.c.	Hot bed transfer
	10	220—a.c.	Finish shears
	50	220—a.c.	Cut-off saw
	100	2,300—a.c.	Straightener
	15	220—a.c.	Finish shears
No. 1 Table	3-30	240—d.c.	Table operation
No. 2 Table	3-30	240—d.c.	Table operation
Conveyors	2-30	240—d.c.	Roller line to hot bed
	30	240—d.c.	Roller lines
	30	240—d.c.	Roller from hot bed
	7½	240—d.c.	Roller to shears
	25	240—d.c.	Transfer
	2-7½	240—d.c.	Roller from shears
	30	240—d.c.	Round straightener
	30	240—d.c.	Second section conveyor
10-in.Mill	800	2,300—a.c.	Main drive
	10	220—a.c.	Conveyor
	5	220—a.c.	Conveyor
	15	220—a.c.	Conveyor
	3-10	220—a.c.	Roller conveyor
	10	220—a.c.	Finish shear
	5	220—a.c.	Roller line
	21	240—d.c.	Pusher in
	30	240—d.c.	Conveyor
9-in. Mill	800	2,300—a.c.	Main drive
	2-10	220—a.c.	Roller lines
MISC. SHOPS	3-5	220—a.c.	Roller lines
	2-5	220—a.c.	Shears
	2-5	220—a.c.	Conveyor
	2-18	240—d.c.	Conveyor
	14	240—d.c.	Pusher
Compressor room	264*	2,300—a.c.	Compressor
	10	220—a.c.	Exciter for synchronous motor
	225	2,300—a.c.	Compressor
Hydraulic pump	25	220—a.c.	Pump
	18	240—d.c.	Pump
Machine shop	25	220—a.c.	Line shaft
	10	220—a.c.	Line shaft
	10	220—a.c.	Planer
	5	220—a.c.	Blower
	11	220—a.c.	Emery wheel
Crane	7½	220—a.c.	Bridge
	10	220—a.c.	Hoist
	3	220—a.c.	Trolley
Roll lathe shop	2-15	220—a.c.	Roll lathes
	1-10	220—a.c.	Roll lathes
	1-18	240—d.c.	Roll lathes
Testing laboratory	7½	220—a.c.	Riehle testing machine
Pattern shop	3-10	220—a.c.	Line shaft
Locomotive repair shop	20	220—a.c.	Air compressor
	5	220—a.c.	Line shaft
	3	220—a.c.	Trip hammer
	1	220—a.c.	Emery wheel
Steel foundry	35	220—a.c.	Grinding pan
18-in. Shipping Dept. 20-ton crane	30	240—d.c.	Bridge
	30	240—d.c.	Hoist
	7½	240—d.c.	Trolley

Department	Hp.	Voltage	Duty
Mill crane	30	240—d.c.	Bridge
	30	240—d.c.	Hoist
	15	240—d.c.	Trolley
Billet storage No. 1 & No. 2 cranes	2-14	240—d.c.	Bridge
	2-14	240—d.c.	Hoist
	2-5	240—d.c.	Trolley
Mill repair crane	25	240—d.c.	Bridge
	25	240—d.c.	Hoist
	5	240—d.c.	Trolley
10-in. Mill shipping dept. No. 1-No. 2 crns	2-7½	240—d.c.	Bridge
	2-14	240—d.c.	Hoist
	2-5	240—d.c.	Trolley
No. 1-No. 2 Monorail	2-14	240—d.c.	Hoist
	2-5	240—d.c.	Trolley
	35	220—a.c.	Straightener
	25	220—a.c.	Straightener
	2-5	220—a.c.	Shears
Pump house	150	2,300—a.c.	Pump
	75	2,300—a.c.	Pump
	35	220—a.c.	Pump
Chemical laboratory	2-1	220—a.c.	Grinding
	1-½	220—a.c.	Line shaft
	2-1-kw.	Heating plates	
TOWER DEPT.	3-10	220—a.c.	Shears
	2-5	220—a.c.	Shears
	1-3	220—a.c.	Shears
	9-10	220—a.c.	Punches
	3-5	220—a.c.	Punches
	3-5	220—a.c.	Punches
	1-10	220—a.c.	Bolt room
	1-25	220—a.c.	Bulldozer
	1-10	220—a.c.	Bulldozer
	1-20	220—a.c.	Air compressor
	1-3	220—a.c.	Grinder
	1-1	220—a.c.	Blower
	1-10	220—a.c.	Dryer
	1-½	220—a.c.	Door lifter
	1-5	220—a.c.	Shaker table
	1-5	220—a.c.	Oil pump

For the d.c. cranes in the tower department, a 65-hp. motor is direct-connected to a 50-kw., 240-volt generator. Following are the d.c. motors installed. Because of the diversity of the load it is possible to serve them all with this one motor-generator set:

Shop cranes	98 hp. total connected load
Gantry crane	49 hp. total connected load
Galvanizing crane	19 hp. total connected load
Monorail crane	20 hp. total connected load

The tower department also has a connected lighting load of 23 kw. and a heating load of 15 kw.

* Synchronous

Manual Aids District Office Employees in Relations with Consumers

AS an aid to the employees of the Southern California Edison Company in their relations with the public a small eight-page pamphlet is issued to district offices. The purpose of the manual is not only to lay down some cardinal principles in conduct but to emphasize the fact that meritorious service is the basis of promotion.

The complete text of the manual follows:

To the Employees of the Commercial Department:

The motto of the Southern California Edison Company is "Good Service, Square Dealing and Courteous Treatment." The sure road to advancement with the company lies in the constant, thoughtful practice of those principles. The rewards for merit in the form of advance in salary or position can be achieved in almost exact proportion to the effort put into your work in demonstrating to our consumers, whose convenience and satisfaction are our chief concern, that we furnish the best possible service and that we deal with them squarely and courteously. There is no room or future in the company for anyone who does not live up to these principles in which we give practical expression in our Department of Greater Service.

This little pamphlet is intended as a guide to the employee in that it gives him just a few of the high lights that may assist him in his daily work. A careful study of the book entitled, "Winning the Public," written by our vice-president in charge of business development and public relations, Mr. S. M. Kennedy, is earnestly recommended as a complete guide to the ambitious worker who has cast his lot with the company. We believe you have joined the company not merely to hold your present job at your present salary, but in the

hope that you may advance in position and obtain the rewards that go with merit. There is plenty of room for advancement i nthis great company for men and women who can demonstrate their ability to do their work "just a little bit better."

You may be the only representative of the company with whom many people come in contact. We are relying on you to uphold the company's dignity and principles.

Very sincerely,
W. L. FROST,
General Commercial Manager.

THE TELEPHONE

The company's business is largely handled over the telephone so this point of contact is most important. In order to avoid the annoyance of having to repeat, speak directly and distinctly into the transmitter. Speak slowly and clearly. Be really courteous. Avoid harsh tones and abrupt language. If delays must occur, say "One moment, please." If information must be looked up, ask for the customer's number and call back. If a person called is out, ask if someone else will do. If not, get the number, ask if you may deliver a message and say you will be glad to have the party wanted call as soon as he returns.

In answering calls do not say "Hello," say "Edison Company." If the call must then be transferred to some one else, the answering party should do so by stating his or her name, not by saying "Hello." Telephone calls should be answered promptly.

No company employee is ever too busy to give consumers the considerate, careful, attentive and courteous treatment to which they are entitled. Each employee should regularly ask himself, "Am I making the most of the opportunities offered so that the public, myself and my company may reap the full benefit?"

METER READER'S GUIDE

A good meter reader is courteous and accurate. The courteous reader:

Announces his approach by calling "Edison meter reader."

Greets the consumer cordially and respectfully.

Addresses a consumer by name, if known—otherwise as "Madam" or "Sir."

Speaks cheerfully but not boisterously to children.

Does not jump fences or cut across lawns.

Does not punch holes in screen doors.

Does not use skeleton keys.

Does not smoke on duty.

Does not leave doors or gates open.

Gives needed information; never argues.

Refers all requests for special information to his chief.

Instructs consumer how to read meter when requested.

Is neat in appearance, kindly in manner and businesslike in behavior.

Does not tell the customer the amount of his bill, because of possibility of making a mistake, but if desired, does give him the meter reading.

Removes his hat when entering a residence or when talking with a lady.

The accurate reader:

Takes times to be sure.

Is particularly careful when reading is difficult.

Does not guess through screen doors and in dark corners.

Reports all changes of names, complaints, jumpers, broken seals, meters exposed to weather, bad wiring and special conditions such as "bad dogs," "key next door," "work during day," etc.

Keeps record book neat and up to date.

Checks constants and numbers with meter book.

Marks "OK" after an unusually high reading to indicate to the office that he has rechecked the reading.

The courteous and accurate reader is pleasing to the consumer, appreciated by the management and respected by all.

TIPS FOR ON-AND-OFF MEN

Hundreds of people form their opinion of the company from their contact with on-and-off men. Their services are required at a time when the consumer is often upset with the many annoyances of moving, and the appearance of an Edison man who does his work efficiently, quietly and **promptly** frequently suppies the only cheerful moment of the day.

On-and-off men will find their work will be easier and their successes more marked by observing the following suggestions:

1. Do not fail to complete all "off and on" orders on the day or hour required.
2. When completing an "off" order be sure to open the switch and remove **both fuses** in the entrance switch.
3. Do not leave fuses, good or bad, on the meter. This practice invites trouble from the fact that tenants will fuse themselves up and fail to notify the company of the fact.
4. Do not use pass key to enter a house for "off and on" orders unless permission has been given.
5. Always obtain forwarding address when closing bill is not paid at the time of completing "off" order.
6. Do not use heavier fuses than 15 amperes for lighting service in the entrance switch and 10 amperes in the branch blocks.
7. Be sure your meter readings are correct. The accuracy of the company's accounts and reputation for honesty depend on your readings. Mark dials on your order.
8. Always complete your "off" orders literally regardless of anyone's requesting as a favor that you leave the current on. Inform the customer that arrangements for service can only be made at the office of the company. Give them the office and phone number and courteously request that they apply there.
9. Familiarize yourself with the rate per kilowatt hour and minimum charges for both city and county service.
10. Look for jumpers and report every unusual or unsafe condition.
11. Answer all questions courteously.
12. If the customer is paying a closing bill, thank him and tell him you hope our service has been satisfactory and that you trust we will have the pleasure of serving him again at some future time.
13. Treat everyone with equal courtesy. The party who pays us one dollar a month is entitled to as much consideration from us as the man who pays hundreds of dollars.

TROUBLEMEN

1. You should be the customer's best friend for it is to you he comes in the hour of trouble.
2. Promptness with you is not only a virtue; it is a necessity.
3. Remember that when a fuse blows out there is a reason; find it out and inform the customer. Tell him that a fuse is for his protection. Tell him the danger of overloading a circuit. Suggest a new circuit wired for "convenience outlets" in baseboards, and if the consumer is inclined to listen, tell him the trouble the company takes to give good service and prevent trouble of all kinds.
4. Look for trouble. Do not always wait until it comes. For instance: If you see a limb of a tree that is likely to short wires, make out a trouble order to the district superintendent to trim it off if you cannot do it.
5. If technical advice seems necessary and you are not in a position to give full information, notify the district manager promptly.

SUGGESTIONS FOR BOOKKEEPERS

A good bookkeeper will not sacrifice accuracy for speed because:

Errors in billing antagonize the consumer.

Errors cause work for others in making corrections and adjustments.

Errors cause delays in securing balances.

Errors show in the traveling auditor's report, and reflect unfavorably on the district.

Lack of complete information on the bill annoys the consumer and delays the collector.

Corrected bills make consumers suspicious.

Pro-rated bills, unless they are explained, create an unfavorable impression in the consumer's mind.

Carelessly made, inaccurate bills that cannot readily be understood by customers can but result in retarding the bookkeeper's advancement.

The bookkeeper who considers each bill a message from the Edison company to one of its customers, has the same opportunity to make friends for the company that is given those employees who meet the consumer face to face.

HINTS FOR CASHIERS

The cashier represents the company when the consumer is parting from his money. The situation calls for a pleasant manner and a full knowledge of the transaction leading to this payment.

The successful cashier:

Is tactful.

Is neat and businesslike.

Calls the consumer by name.

Gives the consumer his entire attention.

Makes change rapidly and accurately.

Always thanks the consumer for the payment and adds a smile for good-will.

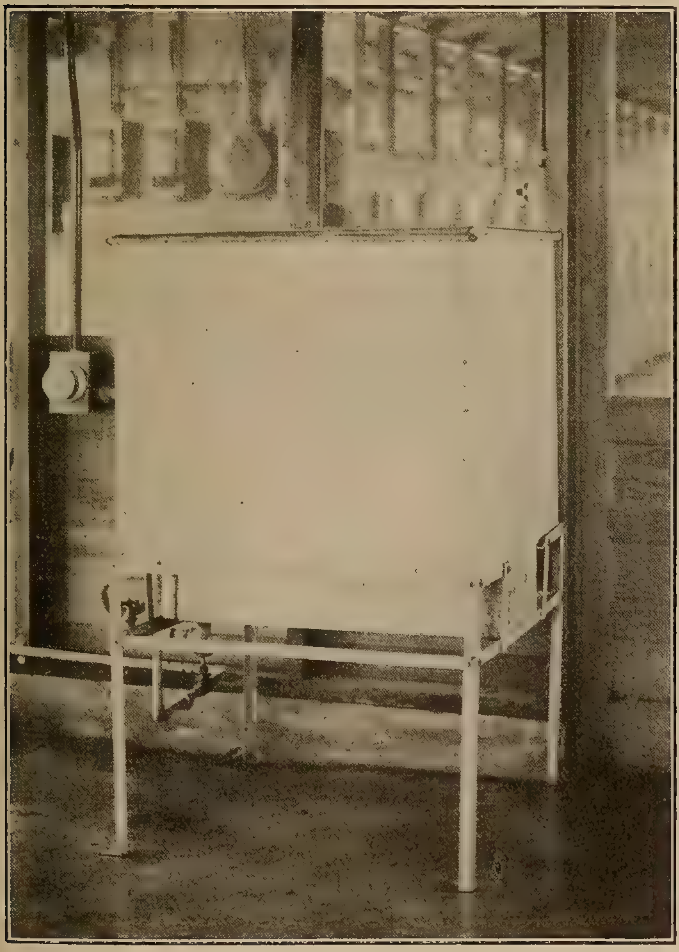
Should never say "Hello" when answering the phone—say "Edison Company."

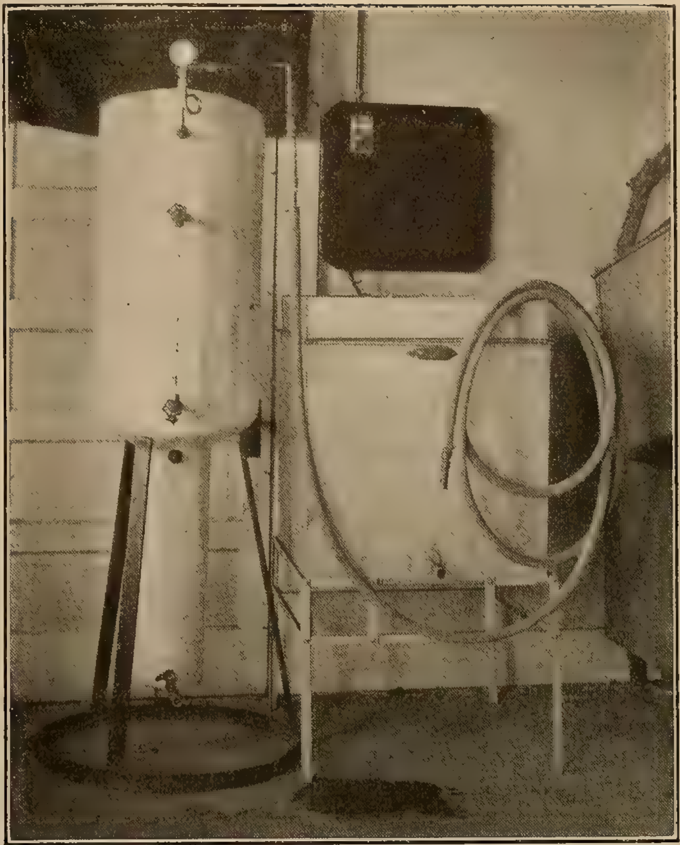
Every cashier should:
Know the rates.
Understand the bookkeeping system.
Be familiar with lamps and appliances.
Ask questions when in doubt and thus avoid giving wrong information.
Look up accounts before cashing deposits.
Take the position that the customer is always right until we can prove to his entire satisfaction that he is in error.
Prompt, courteous, tactful methods at the counter are the mark of a good cashier. If a second customer comes in before the first has finished his business, the cashier should recognize the presence of the second customer by a smile or bow. If a third customer comes in, do not keep him waiting in line, but call for one of your assistants to come forward.
We are pleased and you are to be complimented when people say, "It is a pleasure to do business in an Edison office."

An Electric Sterilizer for the Average-Sized Dairy

AN electric sterilizer which will adequately meet the requirements of 98 per cent of the average dairies has recently been developed by Fred B. Fair of San Joaquin, Calif. This new sterilizer is the outcome of a model brought forth about two years ago and differs from the earlier model in that live steam under pressure in addition to ample hot water is provided for cleaning and sterilizing.

The sterilizer consists of a 30-gal. boiler placed over a heating chamber containing a 5-kw. hairpin heating element. A sheet-metal sterilizing chamber, large enough to hold four 10-gal. cans, is placed adjacent to the boiler. A 50-gal. tank with a 10-kw. element also is being made to meet the requirements of larger dairies.


Early model of sterilizer in which four 10-gal. cans can be sterilized at one time by means of hot water.


In the improved model steam under pressure up to 75 lb. may be used for sterilizing purposes.

Cold water is run into the boiler to levels shown on a water gage, no injector being used to force water into the boiler. The dairyman starts his cleaning operations by filling the boiler and turning an electric switch. The heater soon raises the temperature of the water to the desired heat. Washing operations usually lower the water level to approximately 7½ gal.

Live steam may be generated at any desired pressure up to 75 lb., at which point a safety valve is set to operate. An automatic water level gage and a pressure gage to cut out the current are additional safety devices designed to make the sterilizer practically fool-proof. When cans and parts of separators and milking machines have been washed, they are sterilized by live steam in the sterilizing tank.

The advantage of the electric dairy sterilizer over oil and wood-heated sterilizers are cleanliness and convenience. There are no fumes, soot or ashes to contaminate the milk such as result from the use of oil or wood-burning plants. The electric sterilizing plant is compact, occupying a floor space of 3 x 5 ft., and it can be set up anywhere in the milk-house. The original cost of the electric machine is about the same as that of an oil burner, while the operating cost is very little more. A recent survey showed a cost of 12 cents per day for power in each of six dairies using 5-kw. electric sterilizers of the early type. The steam pressure type has not been in operation a sufficient length of time to determine the costs for power, but the cost is estimated to be about the same as for generating steam by oil-burning.

CENTRAL STATION CONSTRUCTION OPERATION AND MAINTENANCE

Modern Pole-Treating Plant Fills Entire Need

Economical Treatment of All Poles Used on System Effected at New Plant of San Joaquin Corporation.

By D. P. MASON, Manager Supplies Division, San Joaquin Light & Power Corporation, Fresno, Calif.

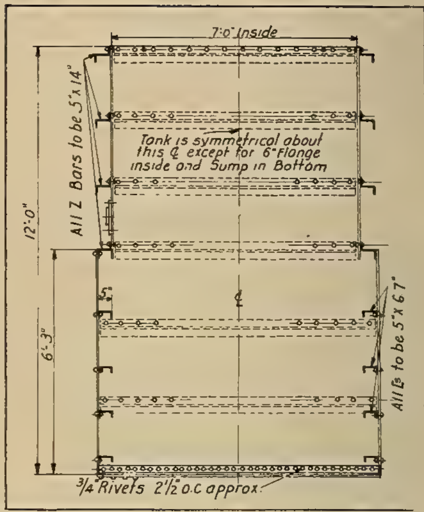
Two carloads of poles per day can be treated at the pole-treating plant of the San Joaquin Light & Power Corporation at Fresno, Calif. The design and layout of the plant are the result of several years experience with the company's former less modern equipment and an extensive study of many other treating plants on the Pacific Coast. Its location is at the center of the company's present pole-storage space where it is readily accessible to rail, truck and handling facilities.

The distinctive feature of the tanks is in the design and location of the heating units. Offsets 5 in. deep and 6 ft. 3 in. high extend the full length of each tank. Steam headers are used for heating the creosote and are mounted in these spaces along the sides of the tanks. Poles are prevented from striking and damaging the headers by ½-in. by 2-in. bars on 4-in. centers running vertically and bolted to the stiffener channels. This construction leaves no projections for poles to become hung up while being lowered into the tank. The highest steam pipe is 6 in. below the lowest level of creosote used in treating.

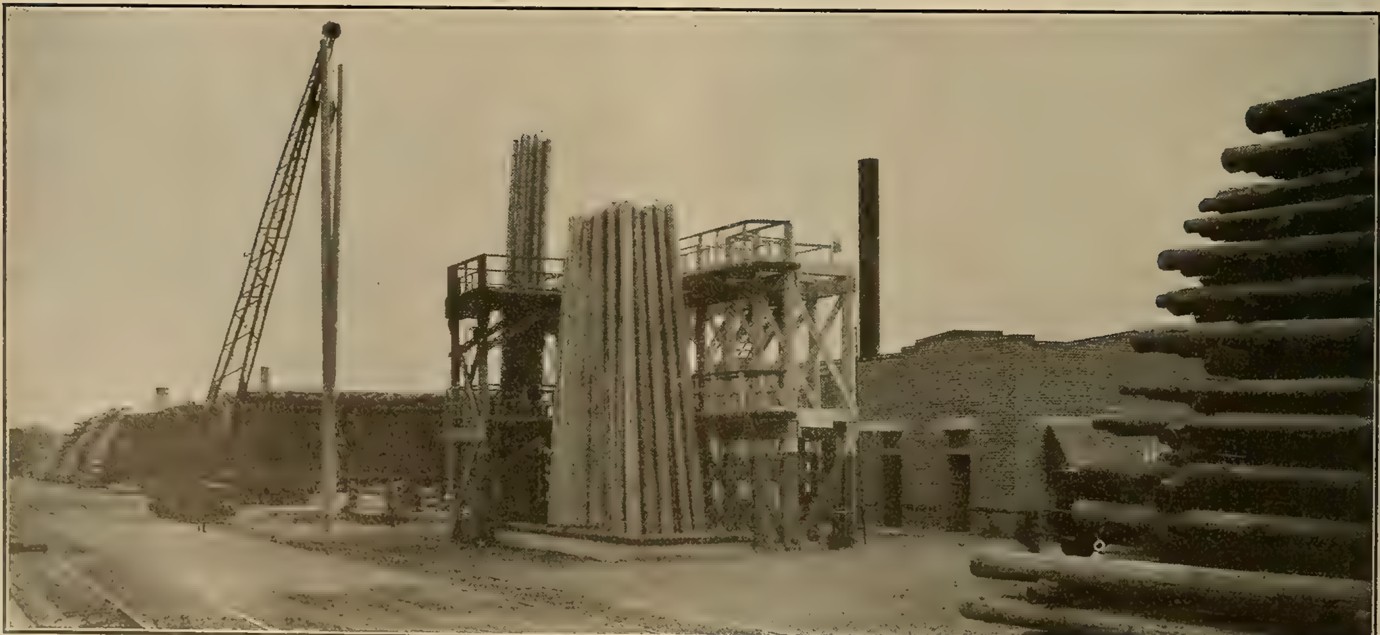
At first thought it would seem that the bottom of the tank would be the logical place to install the heating units. However, by mounting them in the offsets in the sides of the tank 35 per cent more heating surface is made available. Further, the debris which rapidly accumulates from the poles in the bottom of such a tank greatly decreases the efficiency of heating units located in the bottom. Damage is more likely to occur and is more difficult to guard against when headers are placed down where poles must rest upon them or their guards.

Steam headers are used instead of coils because headers are more easily handled and because the condensate will drain more rapidly from a header than from coils. The headers are constructed of standard black pipe, and all joints are welded and tested to withstand a working pressure of 125 lb. Eighteen lengths of 1½-in. pipe welded into 3-in. pipe-headers constitutes each heating unit.

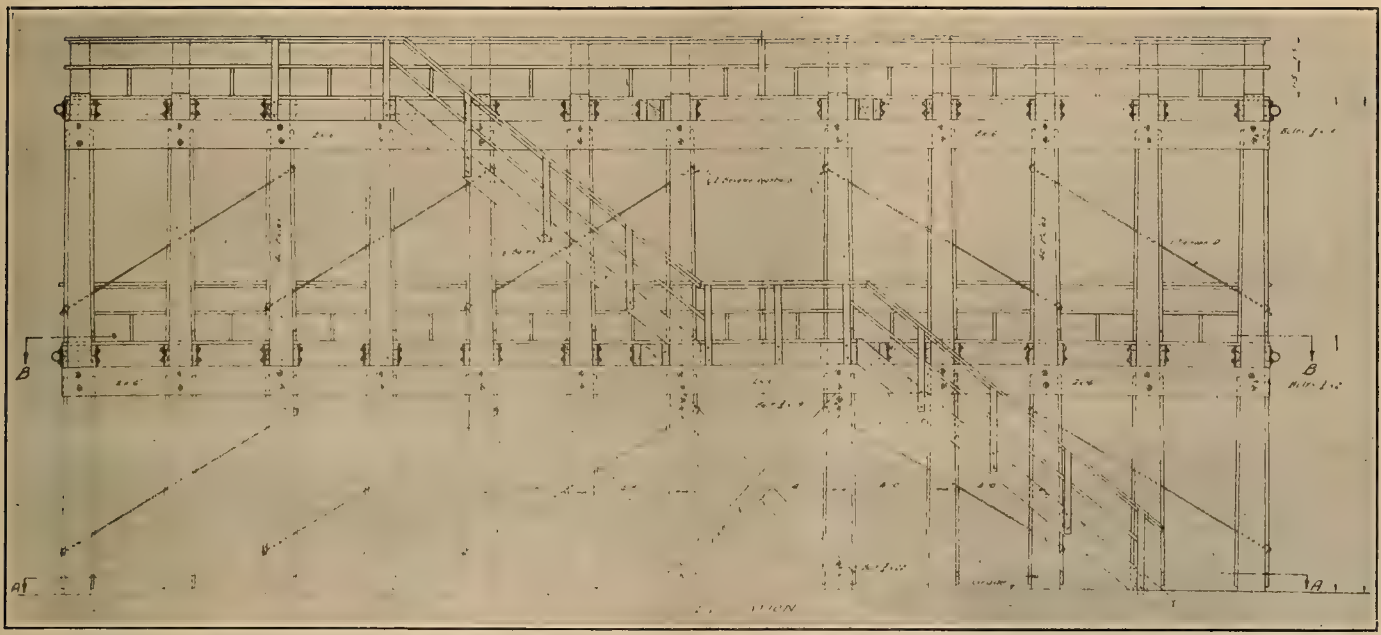
The tanks are constructed of ⅜-in. steel plate with 5-in. channel and Z-bar stiffeners. The larger one is 7x24x12 ft. and the smaller 7x15x12 ft. Each tank sets in its own reinforced concrete pit, and the two are separated by a pump pit. Oiled sand is used under the tanks instead of cement grout because the sand conforms to the outline of the tank bottom nearly as well as grout and prevents the bottom from rusting. The sand also serves as a cushion should poles accidentally be dropped into the tank. Rails, bolted together in sections to facilitate their removal when cleaning the tank, are laid across the bottom of the tank on the inside to form a rest for the pole butts and to prevent them from slipping. The tanks



Cross section of the pole-treating tank showing location of Z-bars and channels used for stiffeners. The offset at either side is to accommodate the steam headers for heating the creosote. A 24-in. sump, to which is connected the suction line of the pump, makes possible the complete draining of the tank.



Preparing to drop a couple of 50-ft. poles into the creosoting vats. The double "L" shape of the structure greatly facilitates loading and unloading the tanks, as they may thus be approached from almost any angle. Two carloads of poles may be treated here at one time. The boiler house appears immediately in the rear of the treating-tank structure.



Elevation of the treating-plant superstructure showing the m ajor dimensions and the method and location of cross bracing.

are entirely self-supporting and do not bear against the pit walls. This enables easy removal of the tanks for repair purposes.

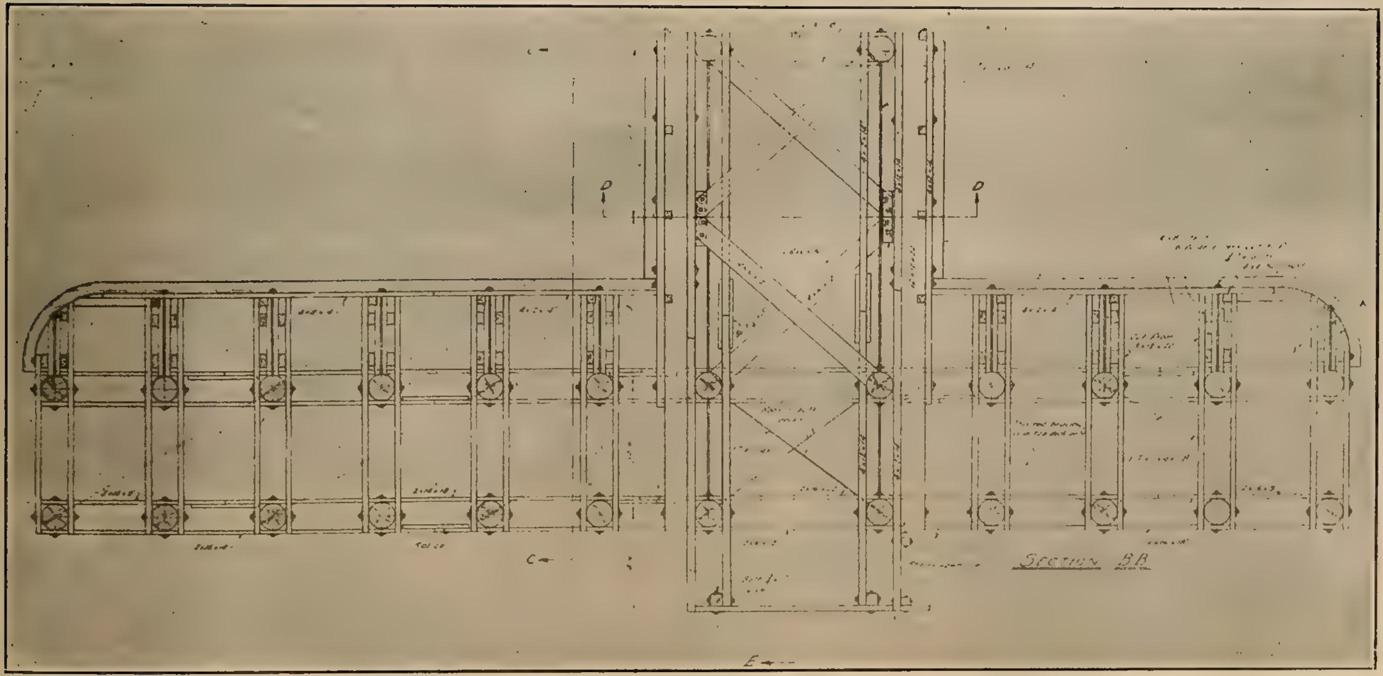
Duplicate pumps for handling creosote are located in the central pit. One of these pumps is a motor-driven centrifugal and the other a duplex steam pump. A motor-operated vertical sump pump controlled automatically by a float switch prevents possible flooding of the pump pit. Sumps in each of the tank pits drain into the sump in the central pit.

Temperature of the creosote in each tank is recorded by Bristol recording thermometers mounted in the pump pit. However, during normal operation it is not necessary to go down into the pit because all valve stems are extended through to handwheels above ground level. The starting mechanism for the pumps is also available from ground level. Each valve is plainly labeled with a metal tag telling just what its purpose is.

The superstructure forms a letter "L" around each treating tank, the bases of the two "Ls" being common. This construction was adopted rather than the more common "U" or "J" shapes because of the ease with which poles may be handled with a supporting structure of this shape. The comparative ease of bracing the other types is more than offset by the disadvantage of operating such a plant where the side nearest the track or crane interferes with the loading and emptying of the tanks by the cranes. Twenty-six cedar poles 40 ft. long of specially picked straight-grained stock, 16,000 ft. of No. 1 select Oregon pine, 33 one-inch steel tie rods, and 800 bolts with C. I. washers went into this structure. The poles are butt-treated for a length of 10 ft. Double decks substantially railed facilitate the handling of poles of various lengths.

From 80 to 140 poles can be treated at one time in the larger tank, and from 45 to 85 in the small depending upon the size of the poles. About three hours is required to load both tanks from stock piles, and about the same to empty the tanks and load the poles on cars ready for shipment.

Apparently the best penetration, which is from 5/16 to 3/8 in., is obtained by bringing the creosote up to a temperature of 215 degrees F. during a period of four hours. Steam is then shut off and the whole mass allowed to cool off until the next morning. However, it is possible to turn out two loadings in 24 hours with nearly the same penetration by increasing the boiling period and then turning in cold creosote



Section plan view of the supporting structure for the treating plant showing some of the interesting design features.

while the hot is being pumped out. This latter operation hastens the cooling.

The boiler house is located just back of the treating vats and is a 35x57-ft. building which houses an office, a change room and a shop as well as the boiler and appurtanences. A horizontal tubular oil-fired boiler designed for 125 lb. pressure and operating at 100 lb. supplies steam to the headers in the creosote vats. A steam connection is also extended to a point where it is convenient to attach it to the cranes to supply pressure for their oil burners until they get up their own steam. One-half inch sponge asbestos covering is used for all live steam lines, and 85 per cent magnesia blocks prevent radiation from the boiler. Practically no make-up in feed water is necessary because

The old pole-treating plant had served its purpose and provided experience of value in designing the new plant.

all condensate from the headers in the treating vats is returned to the boiler through the feed-water system.

Boiler-feed and fuel-oil pumps are all of the duplex type and are provided in duplicate in order to avoid shut-downs while pumps are undergoing repairs. An extra or utility pump serves to load the cranes with fuel oil and for other special purposes. Strainers in the suction and in the discharge lines of the fuel pump guard against congestion of the burner, and an exhaust-steam heater raises the temperature of the oil just before it enters the burner. The burner operates at 30-lb. pressure. An air-dome equalizes the pressure in the oil feed line and a relief valve, the discharge of which feeds in to the suction line of the fuel pump, takes care of any excessive pressure without loss of fuel.

Creosote is stored in two 25,000-gal. tanks constructed of ¼-in. boiler plate and may be handled at will by means of the pumps located in the pit adjacent to the treating pits. Each storage tank may be heated in cold weather by steam coils. The level of creosote in the storage tanks is registered by a float gage. Storage facility for 15,000 gal. of fuel oil is of a similar construction. The three tanks are located at a distance from the boiler house consistent with the fire hazard and are mounted upon 2-in. beds of oiled sand overlaying concrete slabs. Provision also has been made for a future fuel oil tank.

Lighting of the yards adjacent to the treating plant is accomplished through two wide-angle 150-watt Crouse-Hinds flood lights mounted one on each end of the superstructure of the treating tanks. Similar lights are mounted on other buildings in different parts of the yards. In this way the setting of poles throughout the yards for lighting purposes was avoided.

Operation of this plant and its equipment throughout the past year has failed to show up any difficulties worth mentioning. Operators and the corporation alike are satisfied with both results and equipment.

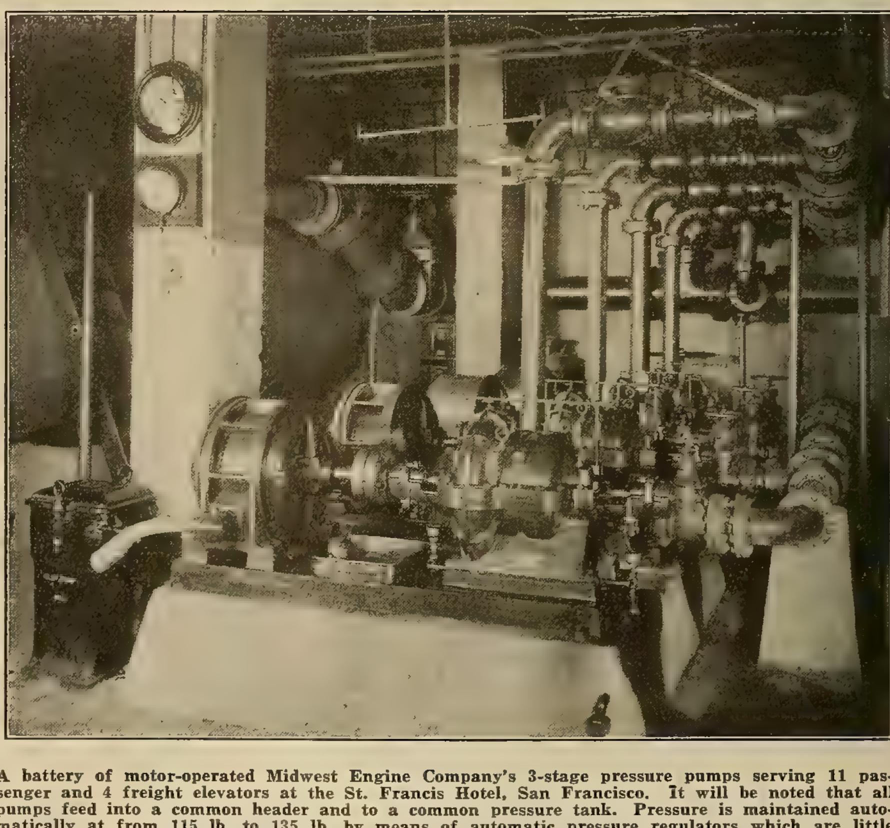
Shell Type Transformer Survives Fall to Pavement

The value of the design of shell-type distribution transformers was demonstrated recently in an accident in Ontario, Canada. In this design of transformer the coils are rigidly braced by the four outside legs of the core that tend to protect them from mechanical damage and exterior abrasion.

The particular accident in question occurred during the process of removing a 40-ft. pole. The line wires all had been taken from the pole, leaving the pole guyed four ways by means of ropes preparatory to the removal of the transformer, which was mounted at a height of 22 ft. above the ground. The tackle was rigged up to lower the transformer by means of a motor truck and ropes arranged through suitable sheaves.

Conditions were such that the truck had to go up a very steep incline and so was forced to start with somewhat of a jerk. The jerk proved to be too much for the old pole, which was rotted at the base, causing the butt of the pole to kick ahead sharply. This broke one of the guy-lines and permitted the pole and transformer to crash together to the concrete pavement. The cast-iron case was badly shattered, but the windings proved by test to be electrically and mechanically uninjured. A new terminal board, a few new core clamps and a new case were all the repairs required to restore the transformer to service.

One Fly Power Sufficient to Run Radio Set 25 Years.—The minute quantity of current necessary for each receiving set to control the local battery current is significantly stated by Dr. L. R. Whitney, director of research for the General Electric Company, who says: "If the amount of work done by a house-fly in crawling up a window pane a distance of one inch were to be put into a receiving tube as energy coming from space, it would suffice to actuate the outfit continuously for a quarter of a century." The radio set is controlled by the smallest unit of power of which man has made practical use. The controlled currents which do the work in the receivers or loud speaker are supplied by the "B" battery. However, the impulses coming from the antenna are the ones which actually cause the set to function.



A battery of motor-operated Midwest Engine Company's 3-stage pressure pumps serving 11 passenger and 4 freight elevators at the St. Francis Hotel, San Francisco. It will be noted that all pumps feed into a common header and to a common pressure tank. Pressure is maintained automatically at from 115 lb. to 135 lb. by means of automatic pressure regulators which are little more than contact-making pressure gages. These regulators control the operating current of control relays, which in turn control the motors through Electric Controller & Manufacturing Company automatic compensators. One relay and one compensator are installed for each motor. Operation is continuously intermittent, the motors being started and stopped every 2 to 3½ minutes. The relays are of the same manufacture as the compensators and are designed to give overload and short-circuit protection on the starting side of the compensators as well as on the running side as it is in the circuit ahead of the compensator. Slow action on overloads and quick action on short circuits is given by the relay through a combination dash-pot and spring arrangement.

Showing the auger-shaft tower set at an angle of 31 deg. from the perpendicular for drilling the lower 11 ft. of a corner-post hole for a dead-end tower.

Shooting the 1¾-in. hole preparatory to cleaning it out with the 8-in auger. The debris from the shot can be seen spouting into the air back of the auger tower which has been swung clear. Note the blocking under the rear wheels for the purpose of leveling the truck.

Machine Bores Tower Foundations in Solid Rock

Apparatus Commonly Used for Drilling Pole Holes in Ordinary Earth Found Adaptable to Rocky Subsoil

Solid rock offers no terrors to the latest in earth-boring machines being used by the Union Gas & Electric Company of Cincinnati, Ohio. This company has been recently engaged in erecting a new transmission line over a particularly hilly and rocky country. An FWD earth-boring machine was experimented with on this project and found to be comparatively as efficient at boring holes for poles and tower footings in solid rock as in ordinary earth.

The 24-in. auger in action. After the 48-in. bit has been used to establish working space on a plane at a depth that can be common for all four corners, a 24-in. hole is sunk from that plane about 3 ft. deep.

Previously the operation of such machines has been restricted to those kinds of soil where holes could be dug by hand methods without blasting.

In the work of digging the holes for the tower abutments many different sizes of augers are used. First the 48-in. bit is used to bring the working level of each corner to the same plane. Due to the hilly nature of the country, this phase of the work frequently necessitates considerable digging with the big auger. After the 48-in. hole is completed to the proper depth, a 24-in. hole is bored about three feet deep at the bottom of the larger hole. From the bottom of the 24-in. hole an 8-in. hole is bored 11 ft. deep and at an angle of nine deg. from the vertical.

Rock is frequently encountered in the digging of the 8-in. hole. The thickness of this rock through which it is necessary to drill varies from a foot or so to the entire depth of the hole. When rock is met with, the first step in sinking the 8-in. hole is to bore a 1¾-in. hole through the rock to the required depth. To accomplish this a 1¾-in. drill is attached to the auger shaft and the hole put through at the rate of about an inch a minute. In one particular instance where the rock extended the full 11 ft. of depth this preliminary hole was completed in two hours and thirty minutes. (Such a hole drilled by hand methods would have taken three men three or four days.) After the small hole is bored it is shot with dynamite and then cleaned out with the 8-in. auger. The cleaning-out process requires but a few minutes.

In sinking the 8-in. holes for the corner posts it is necessary that the degree of slant not vary more than an inch from that desired.

The holes for the corner posts are sunk at an angle of 9 deg. from the perpendicular. It is necessary that the deviation from this specification and the direction of slant should not vary more than one inch in the 11-ft. depth. This exactness is assured by leveling the boring machine with instruments. Then the tower which carries the auger shaft is carefully tilted to the proper degree. At dead-end locations an additional hole is drilled for the braces. This hole is also put down from the bottom of the 24-in. hole. However, in the case of dead-end towers the main holes are dug at 4 deg. from the perpendicular while the holes for the braces are bored at 31 deg. from the perpendicular.

The experiment with the FWD digger on this rock-drilling job was evidently satisfactory for the machine was kept busy 24 hours a day. Flood lights for night work were energized from a portable power plant.

Showing the 8-in. auger bit in place on the shaft and set at the 9-deg. angle ready to clean out the lower 11 ft. of the corner-post hole.

IDEAS FOR THE CONTRACTOR

Industrial Accident Commission Grounding Rules

A Summary of the Requirements which Are in Effect in All Places of Employment in California

By E. EARL BROWNE

There are a good many rules covering grounding requirements as they are enforced in different communities throughout the state. The subject of grounding is covered by the Electrical Utilization Safety Orders of the Industrial Accident Commission of the State of California, which are effective in all places of employment. Therefore they concern practically all contractors, and a uniform interpretation of the requirements to be met will be of interest.

The ground wire for the service entrance conduit shall be No. 6 B. & S. gage copper wire where wires in the service conduit are not larger than No. 0; for larger wires No. 4 is required. It shall be grounded inside the building with a separate ground wire which is not connected to the neutral ground.

All equipment connected to circuits of over 150 volts to ground shall be grounded. When over 150 volts and less than 300 volts, the equipment may be grounded to the conduit carrying the feed wires. A separate ground on the case or frame of the equipment is required where the potential is over 300 volts.

All metal conduit, armoured cable, and metal molding shall be grounded. Table 1 gives the size of wire required for various loads.

The neutral wire of all three-wire secondaries, except three-phase and d.c. neutrals, shall be grounded inside the building with an insulated copper wire of a size indicated by the main service cutouts and Table 1. This ground must be placed ahead of the service switch.

This ground shall be run as a separate conductor from the neutral to ground and be installed the same as required for a current-carrying conductor; unless run in approved conduit, it shall be installed as required for knob and tube work. If conduit is used, the conduit shall be grounded; the preferable way of accomplishing this is by bonding to the service conduit or the service conduit ground wire. Direct-current neutrals shall not be grounded within a building.

More than one ground wire may be run in the same conduit; or a bus ground conductor of one wire may be used, provided it is of sufficient size to equal the total carrying capacities of the connected ground wires and is grounded at more than one place. However, the service conduit ground and the neutral ground shall not be run in the same conduit with the equipment grounds or the grounds for building installations.

Table 1—Required Sizes for Ground Wires (Except for Service Entrance Conduit.)

Capacity of Automatic Cutouts in Amps.	Size of Copper Wire
1— 60	No. 10 B. & S. gage
61— 100	No. 8 B. & S. gage
101— 200	No. 6 B. & S. gage
201— 600	No. 4 B. & S. gage
601—1000	No. 2 B. & S. gage

The service conduit ground and the neutral ground may be run in the same conduit, the neutral ground wire being insulated. Bare wire may be used for all grounds with the exception of the neutral ground. Ground wires do not have to be run as required for a regular circuit wire, although they must be installed in a substantial and workmanlike manner.

Fig. 1 illustrates the application ot these rules in a typical installation.

Bird Electric Company, 309 Main Street, Chico, Calif., is one of the progressive firms who have joined the California Electragists.

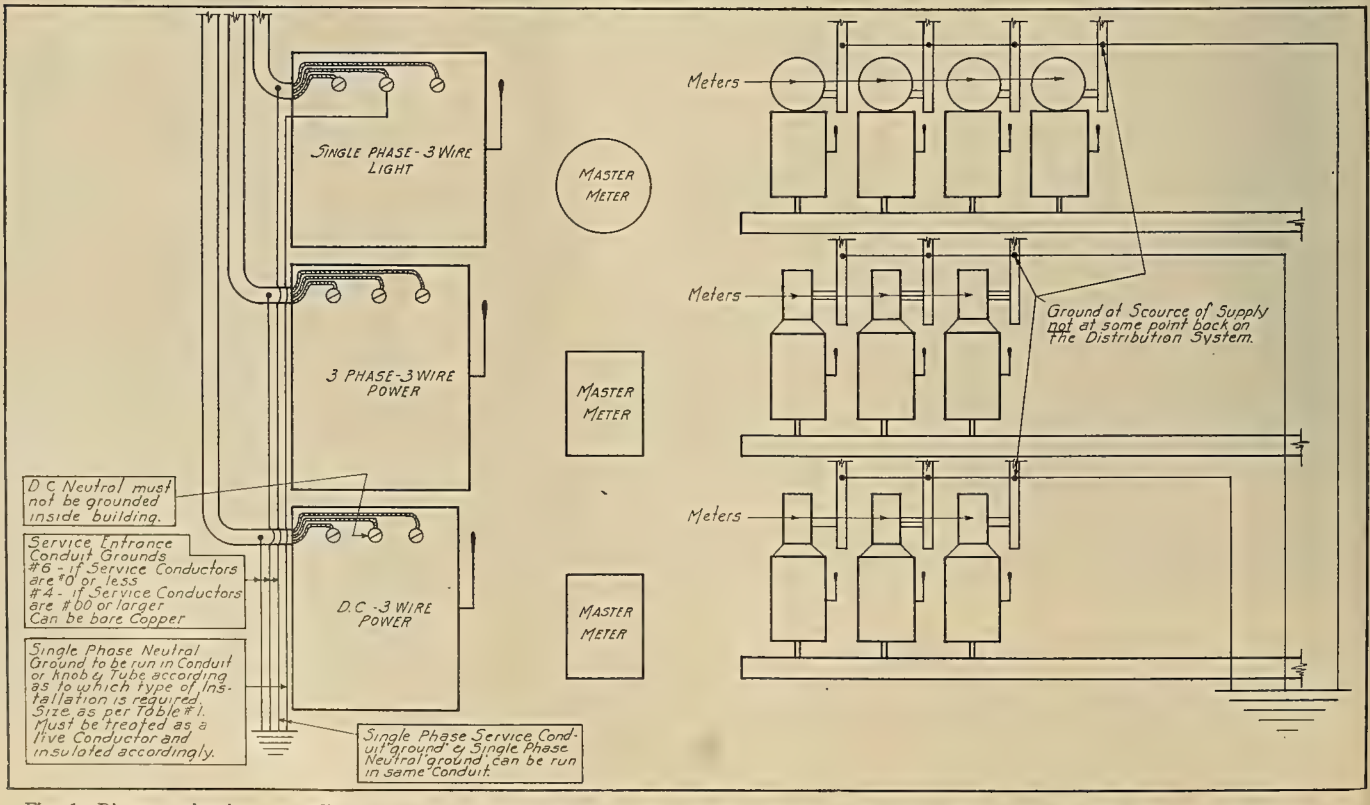


Fig. 1—Diagram showing grounding necessary to comply with the rules of the Industrial Accident Commission of the State of California

The Demand Factor in Heating and Cooking Loads

San Joaquin Light & Power Corporation Conducts Tests to Obtain Average Values Compared with the Connected Load

By E. J. CRAWFORD*
Assistant General Superintendent, San Joaquin Light & Power Corporation, Fresno, Calif.

Diversity of demand as compared with the connected load in heating and cooking installations is a very broad subject and may be viewed from many angles, but I assume that the inspector's chief interest lies in determining the demand with respect to installed capacity, in order that he may specify intelligently the switch and wire sizes required for any particular installation. It is also of prime importance to the public utility, as this demand also determines the size of transformers, meters, and service wire that adequately will serve the job.

We know from tests in our territory that the demand on the same size installation will vary with the city and suburban use. The suburban demand is heavier, probably due to the fact that much more baking is done in suburban homes, and this use will overlap the period during which the top elements of the range are in operation.

Graphic charts were taken on these tests so that we might study the nature of the load and learn not only the demand but also its duration. On quite a representative class of installations we found the following average demands for the several intervals specified:

15 minutes,	65 per cent of connected load
30 minutes,	60 per cent of connected load
1 hour,	54 per cent of connected load
2 hours,	34 per cent of connected load
3 hours,	31 per cent of connected load

This represents average conditions with respect to private residences, both city and suburban, having a combination load of cooking, heating and water heating in addition to lights. It is noticeable that the demand factor is much higher where only a limited amount of apparatus is installed; for example, where only a range and lights are installed as compared with a range, water heater, air heaters and lights. The diversity in the use of the greater quantity of apparatus cuts the demand factor materially.

In apartment houses we found little difference between the 15-minute and 30-minute demand, which was approximately 26 per cent of the connected load, and the demand tapered off from this value to 22 per cent, 19 per cent and 12 per cent, respectively, for one hour, one and one-half hours, and two hours.

In general, we estimate we can handle the metering and transformer capacity for residence loads at approximately 40 per cent of the installed capacity, except as noted in individual cases where there is no diversity. For apartments a still smaller capacity will be adequate, but for commercial loads we must count on the full connected load being in operation for an interval long enough to require full capacity to meet it.

In deciding on wire sizes for the various classes of heating and cooking loads it would undoubtedly be advisable to allow a greater margin of safety, and it might be well to call for a wire which would safely conduct 70 per cent of the connected load for residence installations, 60 per cent for apartments and 100 per cent for commercial installations.

These values, however, will probably vary with the geographical location, and it may be necessary to average the data secured from all sections of the state before specifying anything definite. There is just one warning I would like to give in concluding these remarks, and that is whatever regulations are adopted and approved as standard, that in making them you keep in mind the desirability of avoiding making the installation cost so prohibitive as to prevent the advancement of the use of this kind of load.

*Address made before the semi-annual meeting of the California Association of Electrical Inspectors recently held in San Francisco.

Service Conduit Increased from ¾-in. to 1½-in. in 300 Homes

Through the efforts of Frank J. Kiefer, field representative of the California Electrical Bureau, Baxton & Zweig, building contractors of San Francisco, recently increased the service conduit from ¾ in., as originally specified for a tract of 300 homes being erected in the Balboa Terrace district, to 1¼ in. so that electric ranges and water heaters might be installed, and later to 1½ in. so that air heaters might also be used. J. J. McDonald has the electrical contract for the homes.

Four homes were built with ¾-in. conduit services, twelve with 1¼-in., and the remaining homes will have 1½-in. conduit services. The first home in the tract to be sold was one which had only a ¾-in. service conduit. The buyers wanted an electric range and water heater, and a new service had to be installed before they could move in. Unfortunately this had not been planned when this home had been built so that it was necessary to install the new service on the exterior of the building. This condition is eliminated in the remainder of the homes in the tract that have been built under the new specifications. Mr. Kiefer also has been able to have one lighting outlet installed in each closet in each of the homes and has added an average of one convenience outlet to each home.

Own Installation Sells Show-case Lighting for Contractor

An example of the possibilities of selling show-case lighting through properly equipped cases in the contractor's own establishment was presented recently when R. J. Jacobs, electragist of Santa Rosa, was awarded the electrical lighting contract on forty show-cases for the White House in that city. X-ray show-case reflectors will be used in making the installation.

About a year and a half ago Mr. Jacobs installed similar equipment in his own show-cases. By being able to show his prospective customers exactly what could be expected, he has been able to sell similar installations more readily. He is enthusiastic about this method of selling.

Phillips Electric Company, 427 E. Mendocino Avenue, Stockton, Calif., has recently become a member of the California Electragists.

Pumping Plant Equipment Sold by Aid of Store Installation

An effective method of selling pump installations is being used by E. Roy Nash of Salinas and Monterey. He has a booth on one side of his store in which he has placed a modern pump installation using Westinghouse remote-control equipment and a Western turbine pump.

Anyone inquiring about pump installations is taken to this booth and shown just how an installation made by E. Roy Nash would operate. In this way it is frequently possible to sell a higher grade of installation than ordinarily would be purchased. The customer is better satisfied, too, because he knows beforehand just what equipment will be installed and what it will look like.

Modern pump installation in the store of E. Roy Nash at Salinas used in selling similar equipment

Electricity in the Modern Newspaper Pressroom

San Francisco Chronicle Has Many Interesting Applications and Has Developed an Elaborate System of Remote Control

The San Francisco Chronicle has one of the most complete and modern newspaper establishments in the West. Electricity has a very important role in its operation, and some of the applications of it are worthy of particular attention. The press is of the unit-type, which permits a great deal of flexibility in operation. At the present time fourteen units are installed, with foundations provided for four more units. The black and white press units are operated with four 100-hp. motors. One motor is capable of operating from one to five units, which is equivalent to a forty-page press as each unit has a capacity of eight pages. For over five units, two motors are paralleled. The color press is operated by a 125-hp. motor. A 10-hp. motor is used for starting purposes instead of these larger motors.

All of the electrical equipment of the pressroom is operated by remote control switches which connect with a central control room. Fourteen remote-control stations are installed at convenient locations on the color press and forty-two are on the black and white press. From each of these remote-control stations any of the operators may control the press. Each control station has six remote-control buttons labeled from top to bottom as follows: safe, run, decrease, increase, inch, and stop. In addition there is a signal button at a convenient location at each of these stations. A selector switch puts the remote-control stations on any of the different press unit combinations.

A row of red signal lamps extends completely around the press units. These lamps are normally lighted. When a man wishes to do any work about the press where any danger is involved, he presses the "safe" button of any control station. This extinguishes the red lamps and disconnects all other stations, and it is impossible to start the press until the "run" button on the same station has been pressed. Light signals always are given before starting the press. This practically eliminates all danger from press accidents; and any man found doing any dangerous work about the press without having pressed a "safe button" is discharged immediately.

The "decrease" and "increase" buttons control the speed of the press, which slows down or speeds up as long as the button is depressed; when the button is released, the press continues at the speed it was maintaining at the time of such release.

The "inch" button operates a momentary contact switch so that very small movements of the press may be secured. The "stop" button is self-explanatory.

In the event of a breakdown of any remote-control station, a throw-over switch disconnects all of the remote-control stations on the press and transfers the control to one remote-control station located on the wall away from the press and one station in the control room.

The paper rolls for the black and white press units are located in the basement. A convenient means of access is provided by poles down which the men slide; they return to the main floor in one-man elevators operated with compressed air. One of the features of the operation of the equipment is the fact that the press is not stopped to change rolls of paper. This is accomplished as follows: Supports are provided for two rolls of paper for each unit. A remote-control station is located beside each paper roll. The buttons on this are: paster, decrease, increase, right, and left. After the pressman has completed his pasting and is ready to change the paper rolls, he presses the "paster" button. This slows the press down to a predetermined speed, which has been found to be best suited for the particular pressman at work. The "increase" button causes the new roll of paper to be revolved into place. The paper of the new roll is then put on the line with that of the previous roll and the pressman then signals the operator who brings the press up to speed.

The "decrease" and "increase" buttons of the paster control station decrease and increase the tension of the paper feeding the press, and the "right" and "left" buttons control the margin of the paper from the sides of the press so that it can be centered. This is all automatic and can be done while the press is operating. A number of these tension and margin stations also are located at different places on the press.

There are five rolls to change and each has to be changed about every 9,000 papers. To change a roll in the old way by stopping the press required from three to five minutes. By this method the time lost in slowing down, changing the roll and bringing the press back up to speed is only from 15 to 30 seconds.

The 10-hp. starting motors are used for starting and running the press up to and including the third contact point on the controller; the 10- and the 100- or 125-hp. motor, as the case may be, are used on the fourth and fifth contacts and the larger motors alone on the sixth contact point.

The paper for the color press is carried on reels below the press. An electric hoist raises it into position. Remote-control switches raise or lower the reels. As in the case of the other paper reels, by means of remote-control buttons it may be moved to the right or left and the tension may be increased or decreased.

A conveyor system operated from the press takes the papers to the mailing room. After the press is stopped, the remaining papers on the conveyor are removed by running it with a small auxiliary motor.

Cline-Westinghouse rotary press-control equipment is used throughout. The electrical installation was made by H. S. Tittle, electrical contractor of San Francisco.

The Premier Electric Appliance Company is the firm name applied to the new washer, ironer and vacuum cleaner display and sales room recently opened at 1309 Third Street, Santa Monica, Calif., by C. F. Cross and C. R. Burgess. Savage washers and Premier Duplex cleaners are being featured.

Sonoma County Contractors Form New Development League

At a dinner meeting held recently at the Occidental Hotel, Santa Rosa, the electrical contractor-dealers and others in the industry in Sonoma County perfected an organization to be known as the Sonoma County Electrical Development League. LeRoy H. Crandall, field representative of the California Electrical Bureau, was responsible for bringing the group together. He called the meeting to order and then turned it over to W. W. Shushaw of the Pacific Gas and Electric Company, who presided over the business session. The aims and objects of the proposed club were outlined, followed by an extended discussion by those present.

Tully N. Cornick, electragist of Petaluma, was elected president; H. W. Jacobs, electragist of Santa Rosa, vice-president; Alfred L. Walker, Pacific Gas and Electric Company, Santa Rosa, secretary-treasurer. Herman Weber, O. A. Mundell and C. C. Van Fleet, all of Santa Rosa, were elected to the executive committee. The president appointed the following membership and attendance committee: C. C. Van Fleet, Santa Rosa; Humbert Gonella, Occidental and Sebastopol; William Kenyon, Guerneville and Monte Rio; C. H. Williams, Cloverdale; and A. C. Miller, Healdsburg.

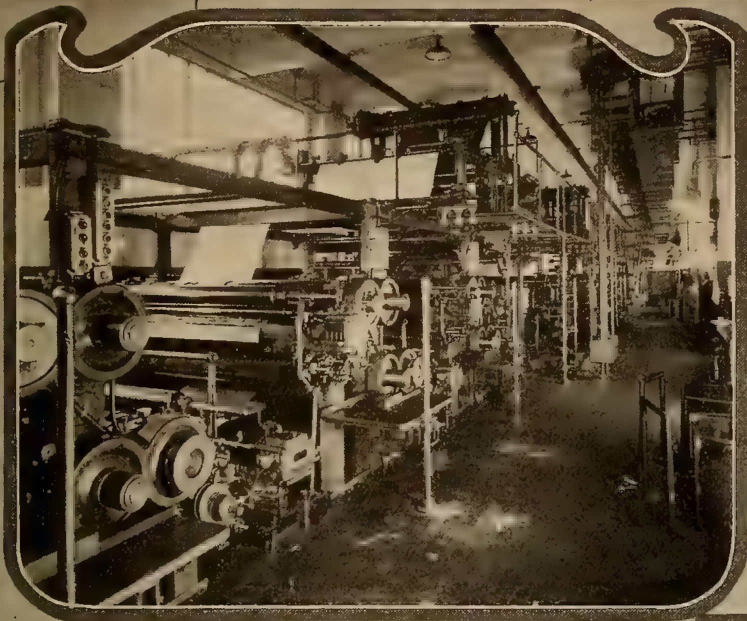
Representatives were present from Santa Rost, Petaluma, San Rafael, Healdsburg, and Occidental. Walter F. Price, executive secretary of the California Electragists, and M. A. Delew, former president of the California State Association of Electrical Contractors and Dealers, were also present. The next meeting of the league will be a dinner meeting at the Hotel Petaluma, Petaluma. The constitution and by-laws will be discussed at that time.

The Electric Shop has recently been opened at 1024 American Avenue, Long Beach, Calif., by L. H. Walter and C. V. Morrison of West Virginia, where they have been in the electrical business for the past fifteen years. They are featuring a distinctive and original type of lighting fixture for the wholesale and retail trade. They have obtained the services of C. S. Lipscomb, illumination engineer, as designer of their fixtures. Mr. Lipscomb was formerly owner of the Medbury Electric Company of Detroit, Mich.

Cook Brothers, 653 South Figueroa Street, Los Angeles, formerly operating under the firm name of Cook Brothers' Hoover Store, have been appointed Western distributors of The Air Electric Cleaners. A. M. Bagley, former sales manager of the Federal Electric Company, is sales manager of the firm.

The Square Deal Electric Company, 5903 Pasadena Avenue, Los Angeles, a new store recently established by L. C. Westbrook, formerly of the Garvanza Electric Shop of that city, will stock a complete line of radio parts in addition to electrical supplies.

P. D. Franco, formerly electrical construction foreman for the Enterprise Electric Company, Pueblo, Colo., has opened a store at 798 Hilldale Avenue, Sherman, Calif., where he will conduct a general electrical contracting and retail business.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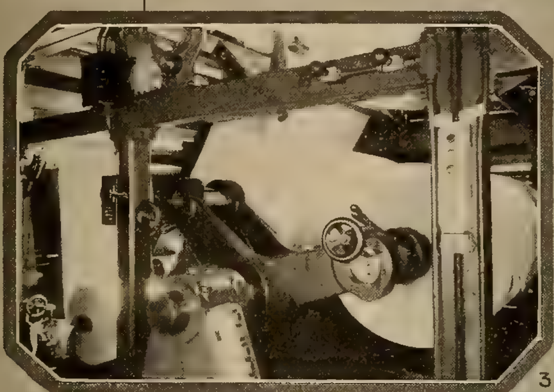
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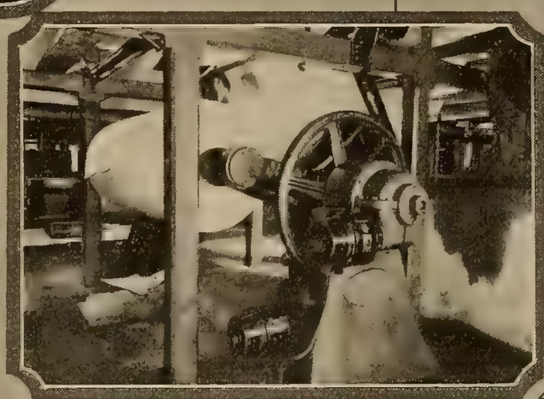
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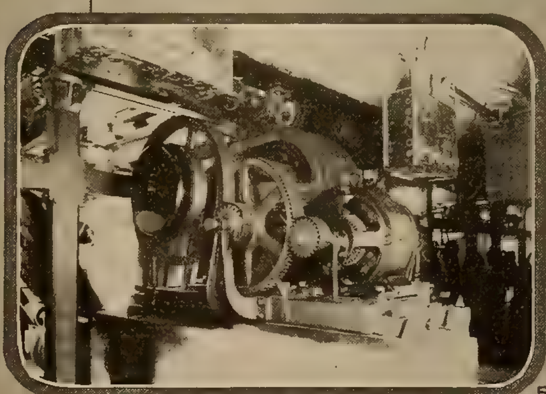
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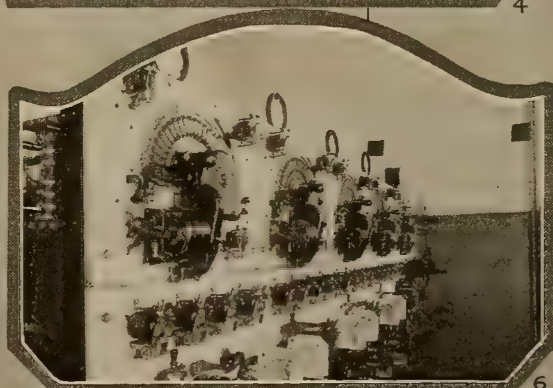
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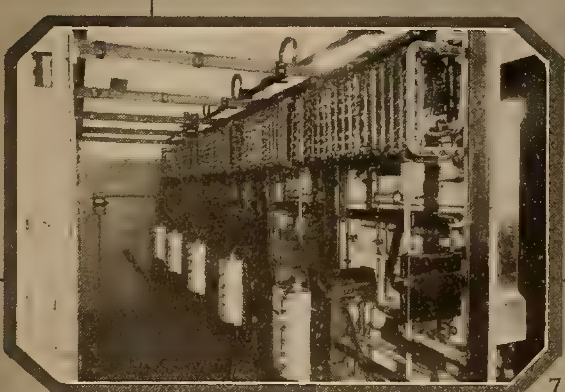
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THE electrical installation in the San Francisco Chronicle's plant is one of the most modern in the country. A general view of the pressroom (1) shows the safety and signal lamps in the foreground and conveyors in the rear. One of the remote controls (2) located near the end of the press insures safe and efficient operation. A paster station (3) below the press is shown with the paper rolls and at 4 the tension and margin mechanism is shown with the two motors used in operating them. The starting and driving motors are shown in 5. The small motors which operate the main controllers (6) are on the front and emergency control stations are on the rear of the main board (7).

BETTER MERCHANDISING

Will You Sell Electrical Gifts for June Brides?

California Electrical Bureau Prepares Dealers' Helps and Advertising to Aid in Sales Campaign

That the June Bride may have a complete assortment of electrical gifts when she starts housekeeping after the honeymoon, a campaign, designed to put these gifts before the public, is to be initiated and sponsored by the California Electrical Bureau. This year's sales drive takes the place of the June Bride Weeks of the past and is planned to continue from about the middle of May until the last of June in order that every June Bride will get her share of electrical labor-savers.

Plans this year center around feature window displays, newspaper advertising and publicity, and intensive merchandising work on the part of the electrical retailers throughout California. To assist these retailers in the work of decorating for the campaign, the California Electrical Bureau has prepared a set of dealer helps consisting of a large poster and five counter cards depicting a June Bride and carrying the message, "Electrical Gifts for June Brides." Each of the five counter cards carries a different sales message which is subordinate to the main theme of the card. The sales slogans to be used are as follows: "Combine Beauty With Service," "Make Her Home Modern," "Are Lasting Remembrances," "Are Faithful Servants," "Mean Leisure Hours."

The counter cards are 7 x 11 in., and the large posters are 16 x 23 in. All of the material is printed in three colors, the counter cards being printed on 8-ply cardboard and equipped with easels. The posters will be on heavy chip board so that they will stand without sagging when supported in only one place. The sets are being prepared by the Bureau and will be delivered to retailers of electrical merchandise for $1.50 per set of two posters and five counter cards. The posters are adapted for use in window displays and the cards for use within the retailer's store.

It is the purpose of the Bureau to see that every retailer of electrical appliances in California is supplied with at least one of the June Bride posters, and for those retailers who do not order the sets a poster has been prepared on a good grade of coated paper stock. These posters will be sent to all retailers not ordering sets with the suggestion that the merchant use them in his window display inviting attention to the suitability of electrical appliances as wedding gifts.

To stimulate the use of specially decorated windows during the period of the campaign, six cash prizes are to be awarded to retailers featuring electrical gifts for June Brides. Although the sales campaign will extend over a period of about six weeks, the Bureau is anxious to have the entire industry concentrate its efforts on the first week in June, and for that reason the prizes in the window-decorating contest will be awarded for displays presented during that week. To enter the contest it will be necessary for the retailer to decorate his show windows with electrical gifts for the June Bride, have a picture taken of the display and send a glossy print of the exhibit to the California Electrical Bureau. The exhibits will be judged by a committee representing the electrical industry and the following prizes will be awarded: $50,

The poster and counter cards will use this illustration in three colors.

first; $25, second; $20, third; $15, fourth; $10, fifth, and $5, sixth. To help defray the expense of having the pictures taken of the exhibits, the Bureau has arranged a special fund from which $1.50 will be paid to each contestant who does not win one of the prizes. The winners will be announced in the Journal of Electricity as usual.

The cooperation of central station companies, manufacturers and jobbers has been solicited by the Bureau with the aim that the electrical retailers may be informed of the coming campaign from as many sources as possible.

Letters have been sent to jobbers' and manufacturers' sales managers, requesting support from those organizations, and the following letter has been mailed to the salesmen of those outlets:

The success which any effort directed toward the retailers is going to meet with can be measured beforehand by the interest which the Jobbers's salesmen have in the activity. That is why we are addressing our first letter concern- this year's Electrical Wedding Gift Drive to you. If we can sell you on the value of the plan, more than half the battle is won; if you aren't interested in it no amount of effort on our part can make much of a success of it.

So please read this letter through thoroughly before deciding whether or not you can advantageously bend your efforts toward helping the drive along.

The idea is the same as June Bride Week drives of past years, except that we aren't going to concentrate on one "Week" this time, we are going to get the display material in the hands of the dealers about May 15 and urge them to hammer upon the thought of Electrical Wedding Gifts from that time until the end of June.

We will, however, designate one week, June 1-6, inclusive, as the week during which we want all dealers to give particular thought to their windows and we will offer six cash prizes of $50, $25, $20, $15, $10, $5, to those dealers who send in photographs of the best trimmed windows displayed during that week. Any dealer who sends in a picture which does not win a prize will receive $1.50 to partially reimburse him for the cost of the photograph.

We are getting out a brand-new poster this year which we believe is a beauty, and are planning to prepare five counter cards to be similar in design to the poster but each will have a different sales message. We are going to offer a set of two posters on heavy cardboard and five counter cards on easels to the dealers at cost, which will be $1.50 per set delivered. To those who do not care to purchase a set we will deliver free a poster on paper in order that they may at least tie in with the drive.

A full-page, three-color ad will appear in the May 1 issue of the Journal of Electricity; newspaper publicity will be arranged for throughout the state; the power companies will mail literature to their consumers calling attention to the appropriateness of electrical wedding gifts; and the power companies which are planning newspaper advertising during that time will also tie this ad in with the campaign.

The "big idea" behind the whole effort is to encourage people to think electrically when they think of wedding gifts. If we can get them to do that it means more business for your retailer customers and more business for you. Will you help?

Your sales manager will be kept fully posted on the progress of the drive—keep in touch with it through him. We will sincerely appreciate your help and so will your dealers.

Sincerely yours,

VICTOR W. HARTLEY,
Executive Secretary.

P.S.—Within a week we will send you a three-color reproduction of the new poster so you can show it to your dealers. Try to get them to purchase the cardboard posters and counter cards. The $1.50 will be well invested. And impress upon them that their checks must accompany all orders.

The sales managers of power companies serving the state have been addressed and their support requested in connection with the work of interesting retailers and the promotion of general advertising of the campaign. The power companies also have been asked to attend to the distribution of the posters and counter cards within their territories.

The direct announcement of the June Bride merchandising campaign has been made to the electrical dealers and other merchandisers of electrical appliances through a letter sent directly to them. This letter giving all of the information concerning the campaign reads as follows:

READ EVERY WORD OF THIS LETTER
A long letter starts to work under a handicap but to do justice to the story we want to tell you it is going to take a long letter and inasmuch as it means dollars and cents in your cash drawer it will be well worth your while to read it thoroughly.

June is almost here, June is looked upon as the outstanding wedding month. Weddings call for wedding gifts and there is not a more satisfactory or more appropriate wedding gift to be found than an electrical appliance. Briefly summed-up that's our story, and that's the story which we want to tell to every purchaser of wedding gifts; and we want to tell it through you so that the demand for electrical appliances will mean more business for you.

In telling this story four advertising media are to be employed:—Window Display, Newspapers, Direct Mail, and Radio.

In order that you may be fully informed as to the plans, we will outline just what it is proposed to do under each of the above headings.

Window Display. We have prepared a brand-new poster this year which is a beauty. It is printed in three colors and will be 16 x 23. In order that you may tie in with this drive we will furnish you a copy of this poster printed on paper, **absolutely free,** getting it in your hands about May 15th so that you may use it from that time on until the end of June. If, however, you desire to really work up an attractive June Bride display we will sell to you, at cost, which will be $1.50 per set delivered, a set composed of two of these posters printed upon heavy cardboard and five 7 x 11 reproductions of the poster also printed in three colors on cardboard equipped with easels, each of the five bearing a different sales message. With nothing whatever to gain through the sale of these posters we would urgently impress upon you the fact that $1.50 spent for a set of this material will be a real investment as it will offer so much greater possibilities of arranging sales producing windows than will the paper poster which we are able to furnish you free. To assist you in building up your sales the power companies are also planning to display these posters in their windows during June.

SIX CASH PRIZES are offered for the best trimmed electrical appliance windows displayed during the week of June 1-6. These prizes are $50, $25, $20, $15, $10, $5, and the winners will be selected from photographs sent in not later than June 13. Every retailer who sends in a photograph which does not win a prize will receive $1.50 to partially reimburse him for the cost of the photograph.

Newspapers. Five sample ads have been prepared and a set is being sent to every newspaper in California with the suggestion that they make an effort to sell these ads, to their local electrical retailers. We will furnish free the small facsimile reproduction of the window poster to tie in the ad with your window display and you can secure the cuts of appliances from your jobbers in order that you will have pictures of the particular line of appliances which you merchandise. As soon as a newspaper writes us that they have sold some of these ads to any of their local dealers and wish cuts we will also send them some publicity stories for use in the same issue as the ads in order to enhance the value of the ads. All power company advertising appearing during this period will be directly tied in with this electrical wedding gift drive.

Direct Mail. The power companies will enclose inserts in all of their mail during June calling the attention of their consumers to the appropriateness of electrical wedding gifts.

Radio. Arrangements are being made for the broadcasting of messages regarding this subject.

To make it easier for you to order the cardboard sets of window material, as you will undoubtedly wish it, we are enclosing herewith an order form and a self-addressed return envelope. Do not lay this away intending to fill it out later on, do it now and mail it immediately together with your check as no orders for these sets can be honored which are received after May 9th and no orders will be filled unless a check accompanies them.

If you are in doubt about any of the above plans ask your jobber's saleman as he has been given full information on the subject.

During the six weeks that the campaign is to be conducted the central stations have agreed to feature June Bride announcements in their advertising copy, thus assisting the electrical merchandisers in their efforts to announce the benefits of electrical devices to the public. In addition to this newspaper advertising, inserts, carrying a reproduction of the poster and counter cards, will be sent out with all mail directed to domestic consumers. These inserts will be similar to those used last year and will carry the message of the usefulness of electrical appliances.

Information concerning the June Bride sales activity has been sent to all of the electrical leagues and clubs in California with the request that the membership of these organizations support the campaign in every way possible. As a final effort to reach the public, it is planned to broadcast a series of radio talks dealing with the appropriateness of electrical gifts for the June Bride.

Publicity Aids Prepared for June Bride Gift Campaign

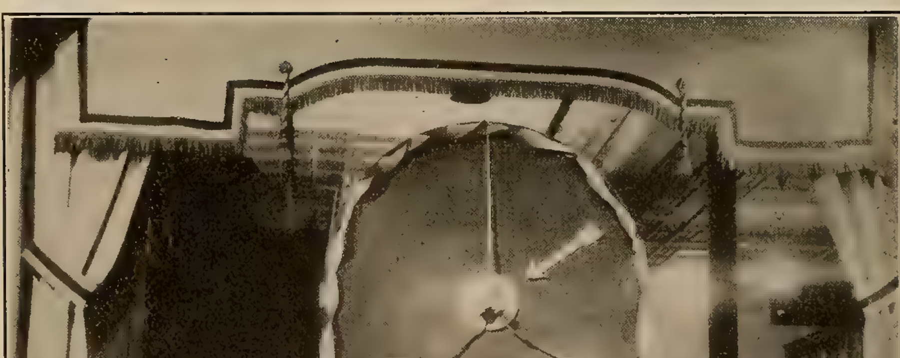
To focus attention upon electrical gifts for the bride, The Society for Electrical Development has prepared a complete assortment of advertising and publicity material for use by electrical merchandisers. The material includes window-display effects, newspaper advertising copy and literature for mailing.

There are eight different items in the assortment of material which the society is offering in combination packages ranging from about $50 to $5 per package. This year the society is featuring a window-display panel, 21½ x 31 in., the original for which was executed by a leading commercial artist. The reproduction will be in ten colors, with heavy board backing and easel, for use in both window displays and interiors.

Other selling helps include a full size, life-like, die cut, five-color reproduction of a bride on heavy board with easel back; an eight-page, three-color envelope size gift suggestion folder; bride cutouts, 8 in. high; two-color 7 x 12 in. window cards with selling message; advertising material consisting of advertising suggestions, proofs and mats, lantern slides and a sales manual containing hints on conducting a campaign, including window-display ideas and selling pointers.

One of the window-display panels prepared by The Society for Electrical Development.

All of the material will be ready for delivery the first week of May in plenty of time for most effective use in June. An informative circular giving complete prices and information about the material may be secured from The Society for Electrical Development, 522 Fifth Avenue, New York.



Whose Is It?

Despite the fact that the company submitting this entry in the window-display contest of the Benjamin Electric Manufacturing Company is entitled to one of the prizes, the owner of the display has not claimed the award. Inasmuch as the entry was not identified, the Benjamin company has been unable to locate the winner. According to the company, a good prize is waiting for the electrical dealer who arranged the display. To secure the prize the winner is requested to send a duplicate print of the original picture to the advertising department, Benjamin Electric Manufacturing Company, 120 Sangamon Street, Chicago, Ill.

NEWS OF THE INDUSTRY

Power Sites in Washington and California Requested

An application covering a proposed project on the Toutle River in Skamania and Cowlitz Counties, Wash., has been presented to the Federal Power Commission by Dr. H. W. Coe. The proposed installation consists of a dam at the outlet of Spirit Lake designed to raise its level 13 ft. and to create a storage capacity of 16,000 acre-ft.; a flume about 4,000 ft. long leading to a power house to have a capacity of about 300 hp.; and a diversion dam just below the mouth of Coldwater Creek with a flume about 10 miles long leading to a power house having a capacity of about 12,000 hp.

J. W. Preston, Jr., has applied for a preliminary permit for an installation in the Middle and South Forks of Mokelumne River and the North Fork of Calaveras River, in Calaveras County, Calif. The scheme of development provides for the diversion of the headwaters of the South Fork of the Mokelumne into McCarty Reservoir on the North Fork of the Calaveras, with a conduit about five miles in length leading to a power house on the stream; a diversion dam on the South Fork of the Mokelumne, two miles above its mouth, with a conduit leading to a power house on the Mokelumne three miles below the mouth of the North Fork; a diversion dam on the North Fork of the Calaveras River with a conduit leading to the Mokelumne River power house; and a reservoir on the Middle Fork of the Mokelumne formed by a dam above the mouth of Bear Creek, with a conduit leading to a power house on the South Fork, north of Railroad Flat. An alternative scheme provides for a reservoir on the South Fork of the Mokelumne River, near Railroad Flat, and the omission of the diversion from the South Fork and of the McCarty Reservoir and its power house, conduit, and other equipment. The types of the proposed structures and the capacities of the installation have not been determined.

Lewiston Accepts Offer of Power and Lumber Companies

Acceptance of the provisions contained in the proposal of the Inland Power & Light Company and the Clearwater Timber Company (Journal of Electricity, April 15, 1925, p. 297), was given by the city council of Lewiston Idaho, on April 13. The proposal of the two companies contemplates the erection of a 10,000-kw. hydroelectric plant and a sawmill with a yearly capacity of 200,000,000 ft. in the immediate vicinity of Lewiston.

The two companies voiced their willingness to go ahead with the development projects, provided the city secure for them at a reasonable price the necessary lands and right-of-way and withdraw its application to the Federal Power Commission for a permit to develop power on the Clearwater River. In accepting the proposal the city council stated that the city's application for the water permit will not be withdrawn for four weeks and that no action would be taken on the bonds for the municipal power project for a like period. If the companies proceed as proposed, both the application and bond issue will be withdrawn.

Southern Sierras Company Sues to Get New Valuation

Seeking to have the federal court overturn the valuation of its properties for rate-making purposes, made by the California Railroad Commission, on the grounds that such valuation is unduly low, the Southern Sierras Power Company has filed suit against the Railroad Commission in the Federal District Court of Los Angeles, and asking an increase in rates of approximately 10 per cent.

In this case, which involves an attempt to procure from the court an increase in practically all of its rates for electric service in the counties of Inyo, Kern, San Bernardino, Riverside and Imperial, except where The Southern Sierras Power Company comes into competition with the Southern California Edison Company, the company claims that the valuation of its properties, made by the Railroad Commission in 1920, is so low as to result in confiscation under the constitution of the United States. The court is asked to enjoin the Railroad Commission from enforcing the rates which are now in effect. The company also asks for an injunction to prevent interference by the Railroad Commission with a totally new schedule of higher rates which the company proposes to charge in lieu of the Railroad Commission's rates.

In 1920, in the last main rate case involving this public utility corporation, the Railroad Commission fixed the value of the properties used by the company in rendering its electric service at $7,618,541, and established rates upon that valuation. The commission in its decision declared that it used the reasonable cost of the property to the utility as the basis for this valuation. The company now contends that the cost to reproduce the properties at the highest peak prices of 1920 should have been used, and claims that the value should have been fixed at not less than $10,961,559.

Washington City May Install Modern Street Lighting System.—The city of Everett, Wash., is considering a plan to install a modern lighting system throughout the city by forming an improvement district. The project is backed by the Chamber of Commerce and various civic bodies.

Construction to Start on Feather River Power Development Project

Construction on the Buck's Creek power plant on the Feather River in northeastern California, it is expected will be started by the Feather River Power Company, San Francisco, within a month, according to Lars Jorgensen, head of the engineering department of the company. This project is the first of a series of seven with a total ultimate capacity of 415,000 hp. that is contemplated by the company.

The Buck's Creek plant will have an installed capacity of 60,000 hp. and will operate under a head of 2,480 ft. Thirty thousand-hp. units will be installed in the projects as far as is possible. According to present plans, development will be in the following order: Buck's Creek, 60,000 hp.; Bean Creek, 90,000 hp.; Nelson Point-Sherman Bar, 90,000 hp.; Middle Development, above Bald Rock Canyon, 120,000 hp.; Buck's Creek No. 2, 15,000 hp.; power plant below Bidwell Bar, 30,000 hp.; and below dam at junction of Middle and South Forks of the Feather River, 10,000 hp.

To control the flow of the river a series of reservoirs is contemplated. Two of these are planned for immediate development—Grizzly Valley, with a storage capacity of 92,000 acre-ft., and Gold Lake with a 19,000 acre-ft. capacity. Clio reservoir with a capacity of 130,000 acre-ft. probably will be the third site developed. Other reservoirs with capacities ranging from 115,000 acre-ft. to 96,000 acre-ft. will be constructed as they are needed.

Financing of the Buck's Creek project has been completed, according to Mr. Jorgensen, and as soon as water rights and rights-of-way are settled finally construction will be started. R. C. Storrie & Company will do the construction work on the project.

Negotiations for output of the Buck's Creek plant are being conducted with the Great Western Power Company. It is understood that delivery of the power will be at the plant switchboard.

Booklet on Aerial Photography Published.—"Engineering Data from Aerial Views" is the title of Bulletin No. 1 recently issued by Brock & Weymouth, Inc., Engineers, of 1607 Walnut Street, Philadelphia. This booklet gives a brief discussion of the various pieces of equipment used in aerial photography together with twelve interesting illustrations.

Colorado Minimum Lighting Bill Not Passed by Senate

Efforts of the electrical industry in Colorado to have the state legislature adopt a measure providing for minimum standards of lighting in places of education, amusement, and employment (Journal of Electricity, March 15, 1925, p. 224), failed due to a political deadlock at the end of the session. After having successfully passed the house by a margin of 47 to 7, the measure was "footballed" by various senate committees. In the final committee, even with a willingness of five of the seven committee members to report the bill favorably to the committee of the whole, the chairman refused to take such action.

The measure which did not ask for an appropriation or create any new jobs was considered certain of passage on merit alone, but its adoption was sacrificed to personal politics, according to members of the Electrical Cooperative League of Denver who sponsored the measure. Plans are already under way for the introduction of a similar measure at the next session of the legislature two years hence.

Book on Political Ownership Is Published by N.E.L.A.

"Political Ownership and the Electric Light and Power Industry" is the title of a book just issued by the National Electric Light Association under the direction of the Public Relations Section executive committee. In six sections the book discusses all phases of the municipal ownership question and presents much valuable data.

The first section is devoted to a series of questions usually asked regarding government ownership with answers covering each question. The second section contains opinions and expressions by people prominent in political, public and business life. Sections three and four are devoted to graphic comparisons and statistics between municipal plants and private companies. Part five lists abandoned municipal plants by states. Part six contains a brief history of the municipal-ownership movement.

Copies of the book have been distributed to all member companies. Cloth-bound copies are being distributed to all college and university libraries and to public libraries. Additional copies may be secured from the headquarters of the N.E.L.A. at $1 each for paper bound and $1.50 each for cloth bound.

Electrification of Washington Farms to be Surveyed

Plans looking toward a survey of the farming districts in Washington, from the point of view of the electrical industry, were prepared at a meeting of the Washington Committee on the Relation of Electricity to Agriculture held at Pullman, Wash., in January of this year. It has been announced recently that this work will be carried on by Prof. L. J. Smith, head of the department of agricultural engineering at Washington State College. Work will be started in June, after the close of the present college year. The survey will be similar to that conducted by the Oregon Committee on the Relation of Electricity to Agriculture. (Journal of Electricity, Sept. 15, 1924, p. 221.)

The survey will cover widely separated districts embracing all the agricultural industry of the state, and will attempt to discover the extent to which the farms are electrified and what use is being made of electric service in the different districts.

At the Pullman meeting a small executive committee was chosen to direct the work. The chairman of this committee is E. C. Johnson, dean and director of the college of agriculture and the state experiment station, Washington State College. The other members, in addition to Prof. L. J. Smith, are: D. L. Huntington, president of the Washington Water Power Company; A. W. Leonard, president of the Puget Sound Power & Light Company; Huston McCroskey, rancher of Garfield, Wash.; and H. V. Carpenter, dean of engineering, Washington State College.

Portland Electric Power Company Has $2,000,000 Budget

With a budget for 1925 totaling about $2,000,000, the Portland Electric Power Company is well under way with its development work for this year. The largest single item is for a 60,000-volt transmission line from Oregon City to Salem, Ore., via Newberg, involving the working over of 20 miles of present line between Oregon City and Newberg, and the building of 30 miles of new line from there to Salem. This line, which will be placed on single wood poles with triangular construction, is the second transmission line between the terminal points, but it will follow a different route from the old one and tap a new territory.

A second important addition to the transmission system as proposed in the budget is the construction of the second circuit from the new Oak Grove plant to Cazadero, Ore., about 18 miles. This circuit will be placed on the steel towers installed as part of the Oak Grove development, and, though spaced for 115,000 volts, will be operated for the present at 60,000 volts.

The budget further provides for a new subway from Station "L," the principal steam plant of the company, to Sullivan's Gulch in Portland, a distance of about 6,500 ft. In this subway will be laid two 11,000-volt cables, and it is planned to continue this underground construction in future years from the gulch to the Knott Street substation. Other minor additions to the transmission system are projected, as are also numerous small items in the distribution group.

No additional generating capacity is planned for 1925, though a number of relatively small improvements will be made at several of the plants and substations. A small allotment is made in the budget for experimental and preliminary development work on the company's holdings on the Clackamas River.

Tie Line Near Completion.—The tying in of a 66,000-volt transmission line from Taunton to Hanford, Wash., will be completed in the near future by the Pacific Power & Light Company. The line connects with the lines of the Washington Water Power Company at Taunton, and ties into the Pacific company's trunk line, which supplies the Yakima valley, at Priest Rapids and Hanford.

No Apology Is to Be Made for Wyer Niagara Falls Report

Washington Correspondence.

Despite the storm of disapproval which has followed the publication by the Smithsonian Institution of Samuel D. Wyer's monograph on "Niagara Falls: Its Power Possibilities and Preservation," there is every evidence that no apologies are to be offered for the publication. Officials of the Institution seem to regard the work as a fair presentation of the subject that was done exceptionally well in the small compass of the pamphlet. It is admitted that half a dozen words, calculated to irritate, might have been omitted without weakening the document, but even these are such trifles as "dodging" sinking funds and "subsidizing" rural lines.

Sir Adam Beck's reply would have made more impression on persons who think, it is pointed out, had he not resorted to the calling of names. The publication, in this instance, is entirely comparable with hundreds of scientific papers which the Institution has put out. Exceptions are taken to many of them by those who are not in accord with the views expressed, but ordinarily the objections are pitched on a somewhat higher plane than those in this instance which apparently are inspired largely by the Hearst newspapers and the National Popular Government League. The latter institution has the reputation of being ultra-radical. The publicity which has been given the report by the attacks upon it has had the effect of bringing in numerous favorable appraisals of it.

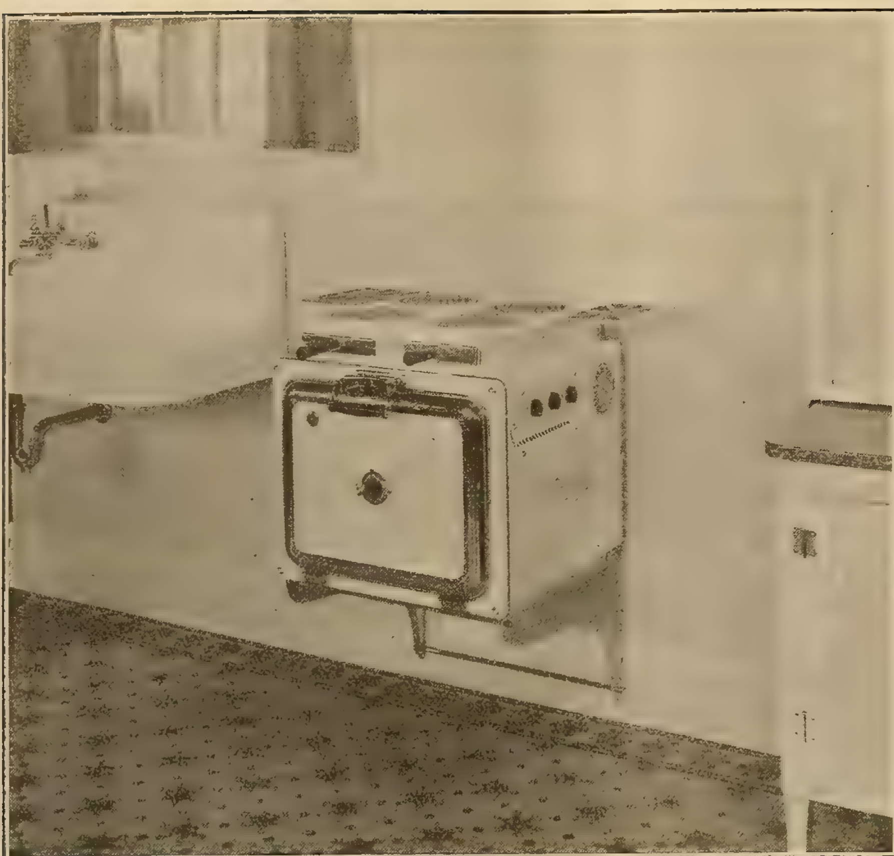
Apparently the protests have not impressed the administration, as it is understood that Mr. Wyer has been sent to Muscle Shoals to make a special report for the President.

Florence Lake Tunnel Officially Goes Into Service

The gates at the north portal of the Florence Lake tunnel of the Southern California Edison Company were opened officially for the first time the morning of April 13. This act started the passage of the first water to be diverted from the upper San Joaquin River through the tunnel and Huntington Lake, and marked the final step in the completion of the world's largest power tunnel.

Only a small amount of water was permitted to flow through the gates. This amount will be increased slowly from time to time until the full flow is being passed. In adopting this method of regulating the flow, it will be possible to wash the accumulated debris from the tunnel slowly. Otherwise this material would be washed en masse into Huntington Lake and result in clouding the waters for some time until the sediment finally sank to the bottom.

Kuhara Mining Company, Japan, Plans Power Plant.—A hydroelectric power project to develop an initial capacity of 50,000 kw. through the appropriation of water from the Shirakawa and Koshirakawa Rivers, running through the prefectures of Gifu and Toyama, Japan, is planned by the Kuhara Mining Company. Construction is expected to start shortly. The proposed development has a potential ultimate capacity of 100,000 kw.



New Armstrong automatic electric range installed in modern kitchen

New Type of Electric Range Has Been Put on Market

A new type domestic electric range has been placed on the market by the Armstrong Manufacturing Company of Huntington, W. Va., that is claimed to have many refinements. One of the most striking features is the absence of legs on the range, which is installed in the kitchen by means of a wall bracket.

The new product of the company, which originated the Armstrong table stove ten years ago, is finished in white enamel and polished nickel throughout. According to the manufacturer, all of the heating elements can be replaced without the use of tools, and it is claimed that the entire range can be taken apart and assembled with the use of only a screw driver.

The body of the range is 23 x 23 in., and wall brackets are designed to support the range, which weighs less than 150 lb. Four heating elements are located on top of the range, two of these being of the open type for quick heating and two of the closed type for cooking of longer duration. The two closed elements include the Armstrong principle of a family-sized waffle mold and toaster drawer, heated both sides at once by a divided element. The manufacturer states that regular cooking operations may be carried on while the front elements are being used for waffle or toast, employing the same heat. Three heat switches control all heating elements.

Oven control is secured by means of a clock-control device which will turn the current on at any predetermined time, maintain a desired temperature, and turn it off at a second stated time. The design of the range is claimed to produce new economies of current consumption.

Alhambra to Install New Street Illuminating System

The city of Alhambra, Calif., nine miles from Los Angeles, recently awarded the contract for a new street-lighting system for its principal thoroughfare to J. C. Perry of Los Angeles. This ornamental lighting will extend on Main Street from the eastern to the western city limits, a distance of about three miles.

The higher standard is the new one being installed along the main business street of Alhambra, Calif. Note overhead wiring to old standard.

It will consist of 238 two-light ornamental standards manufactured by the Union Metal Manufacturing Company of Canton, Ohio, each topped with two General Electric medium alabaster rippled glass Novalux units. This system will replace five-light standards overhead and now in use in the business section.

The new standards are 17 ft. 6 in. to the light center and are spaced opposite each other an average of 135 ft. apart. Each is equipped with a General Electric auto transformer with taps for 4,000, 6,000 and 10,000-lumen lamps. Six thousand-lumen lamps will be installed. The underground system of rigid iron conduit and cambric lead-covered cable has been specified to take care of future requirements.

As a safety feature, each standard is equipped with a disconnecting type pothead. If the standard is run into by an automobile or truck and is bent over, the wires are disconnected from the circuit by the pothead so that there is no danger from live wires, and also the service to all the other posts in that circuit is uninterrupted.

The wiring of this system is so installed that both lights in alternate standards are turned off at midnight, and the lights in the remaining standards continue to burn all night. In this scheme the system has a balanced appearance after midnight. Also there is only one circuit up each post and therefore only one pothead instead of two.

Electric Traffic Towers to Be Installed in Denver

Electric traffic towers will be installed on the principal downtown streets in the business section of Denver to replace traffic policemen, according to the proposed new traffic ordinances, an outline of which has just been announced by the city administration in Denver. The erection of these towers in a large district in which the parking laws will be enforced, different headlight standards, and definite rulings concerning the use of colored lamps on automobiles will make up the major changes in the proposed ordinance.

From time to time a new electric system of traffic control has been considered, but evidently the matter has been allowed to drop due either to lack of funds or of interest, according to reports from Denver. At the present time no electric traffic signals are in use at any point in the city, and the installation of the proposed towers will relieve in a great measure the serious traffic problems now being encountered in that city.

Operating Manual on Polyphase Watt-Hour Meters Published.—"Connection Checks for Polyphase Watt-Hour Meters" is the subject of Bulletin No. 8 of the Engineering Extension Service of Purdue University. This work is largely a compilation of material which previously has appeared in various publications. The booklet is designed to serve as an operating manual on the subject. All theory as to why the checks work out is omitted. Each different method is laid out carefully in the most logical order and lists the special apparatus needed, the method of procedure, the interpretation of results, the advantages and the disadvantages of the method.

Second Annual Meeting of Northwest Technical Section Held in Spokane April 16-17

The influence of power systems on radio reception, the application of electricity to logging operations, accident prevention, and underground distribution systems, were among the subjects bringing forth discussion at the two-day general meeting of the Technical Section of the Northwest Electric Light and Power Association at Spokane, April 16-17. This meeting was the second annual gathering of the section, and the attendance of 120 delegates and visitors exceeded last year's attendance by 38 per cent. Sessions were held in the Davenport Hotel.

H. H. Schoolfield, chief engineer, Pacific Power & Light Company, chairman of the executive committee of the Technical Section, presided over the meeting. The delegates were welcomed by W. H. Ude, director of public relations, The Washington Water Power Company. R. M. Boykin, manager central district, Puget Sound Power & Light Company, Seattle, president of the association, responded to Mr. Ude.

Committee on Cooperation with Regulatory Bodies

Starting the scheduled work of the meeting, Mr. Schoolfield read the report of the committee on cooperation with regulatory bodies, in the absence of its chairman, H. J. Flagg, assistant to general manager, Grays Harbor Railway & Light Company, Aberdeen, Wash. Mr. Flagg reported that the work of his committee had been light in the past year due to the fact that few questions affecting the industry at large had been before the regulatory bodies of the various states. This, he stated, was probably on account of the natural reluctance of such bodies to initiate any important subject in the face of the general elections of November followed by the legislative sessions early this year.

Inductive Co-ordination Committee

Inductive co-ordination was the next subject on the schedule, and G. E. Quinan, chief electrical engineer, Puget Sound Power & Light Company, chairman of that committee, took the chair. Mr. Quinan explained that the work of his committee used to be confined to interference with telephone communication, but that now this problem is largely a national one in which the national committee works with the American Telephone & Telegraph Company, and that there is a common ground of understanding between them. The principal problem before the local committee now is to dispel the popular conception that power systems cause all the interference with radio reception. He pointed out that an excellent opportunity to make friends for the company lies in the routine investigation of radio complaints, which furnishes an ideal medium for the company to get in touch with its customers at a time when they are at recreation.

W. R. Cornell, radio interference department, Portland Electric Power Company, was asked to report on the situation found in the Portland territory, and told of methods he used in running down complaints with the aid of a Ford equipped with a sensitive receiving set and a loop aerial. Among the commonest causes of power system interference he found were: loose tie wires, insulated tie wires, loose splices, tree grounds, trolley contacts and poor bonding of rails on the street car system. He asserted that the largest percentage of trouble with radio reception came from devices beyond the control of the power company, and showed by demonstration the effect of several of these devices on a receiving set. The best known of the outside causes were: small motors, battery chargers, violet ray machines, X-Rays, mercury arc rectifiers, signal systems, heating pads and passing automobiles.

As a further contribution to the report of this committee, E. V. Olsen, assistant to the general agent, The Washington Water Power Company, Spokane, demonstrated the effect of poorly operated regenerative sets on radio reception. Run-down batteries, loose contacts and faulty insulation in antennas and grounds were shown to be the principal causes of trouble arising from this source.

General discussion of the subject brought about an agreement between men who had handled radio complaints for their respective companies that only 20 per cent of all such complaints were traceable to sources within the control of the power company. L. H. Kistler, superintendent of meter department, Northwestern Electric Company, Portland, reported that his investigation had disclosed several bad insulators on 11,000-volt lines, the changing of which probably saved considerable future trouble.

In summarizing the findings of his committee, Mr. Quinan made the following recommendations: that each company should be prompt in attempting to locate trouble, and if responsible for the trouble, to remedy it; that each company should work with the federal supervisor of radio, and with radio dealers, clubs and associations; that all complaints should be looked after promptly and reported on in writing with a letter sent to the complainant; and that the public relations department of each company should be advised of the activity of the radio complaint department with the view to making the most of the opportunity afforded for favorable publicity.

Hydraulic Power Committee

Passing to a consideration of the work of the hydraulic power committee, R. L. Hearn, assistant chief engineer, The Washington Water Power Company, chairman, explained how the activities of his committee were coordinated with those of the national committee, of which he is also chairman. Among the subjects to be reported upon by the national committee in which the Northwest committee is cooperating are, "Power Plant Layout," allotted to the Pacific Coast Electrical Association, "Mechanical Reliability of Water Power Units," Water Wheel Testing and Operating Records of Plant Discharge," "Forecasting Water Supply," and "Pitting of Hydraulic Turbine Runners." The subject of fish ladders has been delegated to the Northwest committee, but it was explained that no work on this subject will be undertaken until after the special committee now working on it is finished with its experiments.

J. B. Fisken, consulting engineer, The Washington Water Power Company, reported on the experiments of his company in forecasting the water supply of Coeur d'Alene Lake by measuring the snowfall on the water sheds of the three main rivers feeding this lake. This was done by finding the average depth and density of the snow in the various areas of the water sheds and by calculation reducing this to second-feet of water. By this method he had been able to forecast the actual runoff within ten per cent. Such information it was pointed out is important in governing the size of the spillway of storage reservoirs so that flood waters will not overflow lands, and, in the case of companies maintaining steam standbys, in estimating the amount of coal to keep in reserve from storage season to storage season. He told of the results obtained by Dr. G. F. McEwen, of the Scripps Institution of Biological Research, La Jolla, Calif., in forecasting precipitation from ocean temperatures, which has proved fairly accurate over large areas of California.

In the report on power-plant efficiency test as related to plant operation, L. J. Pospisil, mechanical engineer, The Washington Water Power Company, described the Gibson method of obtaining the rate of flow of water in a penstock, involving a photographic indication of the result of the changes in pressure in the penstock when the gates are closed against the flow. By this process it was shown that the water-wheel units in the station can be calibrated so as to be used as water meters in future operation. D. W. Proebstel, superintendent of tests, Portland Electric Power Company, explained his adaptation of the Pitot tube method to accomplish the same purpose, his method being known as the multiple-tube method. The application of these tests to plant operation was discussed by E. H. Collins, assistant engineer, The Washington Water Power Company, who showed how, after the efficiency of each individual water-wheel unit in the station was known, the system could be operated the more efficiently. He pointed out that frequently a saving of more than one per cent was possible.

A paper descriptive of the Oak Grove development of the Portland Electric Power Company, by H. A. Rands, project engineer, was read by R. S. Carroll, engineer in the distribution department of that company. The report of the committee closed with a preliminary report on the performance of rubber seal rings in turbines by J. H. Siegfried, superintendent of power, Pacific Power & Light Company, Pasco, Wash., in which it was stated that these rings had not been found altogether satisfactory in the installations on which they had been tried. Other users of these rings had nothing to report as yet.

Apparatus Committee

As part of the report of the apparatus committee, headed by R. R. Robley, operating engineer, Portland Electric Power Company, a paper on "Electricity in the Woods" was presented by R. E. Gray, electrical engineer, Snoqualmie Falls Lumber Company, Snoqualmie Falls, Wash. In this paper, which will be published in full by the Journal of Electricity in a later issue, Mr. Gray described the equipment used by his com-

pany in its electric logging operations, giving some data on the performance of the equipment. The paper precipitated considerable discussion, in which E. F. Whitney, General Electric Company, Portland, pointed out the possibilities in this class of business for central station companies. He made the significant statement that there were some 2,000 logging engines operating in the Northwest, of which only about 25 were driven electrically. This discussion closed the first day's session.

On re-convening the following morning, the meeting heard a continuation of the report of the apparatus committee. The results of tests covering the range of ratio and phase angle of the comparatively new Niagara-type, air-insulated, current transformers were given in a paper by J. Hellenthal, superintendent of transformation, central district, Puget Sound Power & Light Company. He stated that the type of construction and light weight of these transformers made them adaptable for installation in a variety of locations, and he particularly recommended them for service involving differential relay protection.

Different types of temperature indicators for distribution transformers were demonstrated by D. W. Proebstel, who stated that the economic and safe loading of distribution transformers should be on a heat basis rather than on a kilowatt basis, and that manufacturers realizing this had produced four types of thermal indictors.

Overhead Systems Committee

The assignment by the national overhead systems committee to the Northwest committee, of which Z. E. Merrill, assistant general manager, Mountain States Power Company, Albany, Ore., is chairman, of the subject of a comparison between treated and untreated poles was announced by Mr. Merrill. This assignment came too late to be completed before this year's convention but will be continued next year. He announced also that the committee has undertaken the preparation of a map of transmission systems of this geographic division, completion of which is expected by the end of this association year.

First among the subjects to be presented by this committee was the progress report of the tests of pin-type insulators being conducted at the Oregon Agricultural College, Corvallis, Ore., by F. O. McMillan, associate professor of electrical engineering. He explained that insulators of four different voltage ranges from six manufacturers were being tested in accordance with A.I.E.E. standards (Journal of Electricity, Oct. 15, 1924, p. 302) but that a breakdown in one of the high-voltage transformers had delayed these tests somewhat. He described the apparatus and methods used in the different tests, and presented exhibits consisting of photographs and drawings showing dimensions of insulators, and data sheets on which the test data were being recorded. From these tests it is hoped that a uniform method of rating insulators will be evolved.

On the subject of live-line insulator testing three devices were displayed and explained. P. P. Ashworth, distribution engineer, Utah Power & Light Company, Salt Lake City, explained the Aislometer used by his company. This instrument is based on the principal of the electrostatic voltmeter, and when contact is made across a single disc of a string of insulators the vane deflects due to the difference in potential which should exist in the case of a sound insulator. The degree of deflection indicates the stage of depreciation of that disc of the insulator. Similar in purpose is the Iler instrument used by The Washington Water Power Company, which was explained by A. H. Beckwith, assistant superintendent light and power. The Johnson Buzz Stick, which also was explained by Mr. Beckwith, indicates the difference in potential by the sound of an arc passing across a gap set for a certain voltage. Discussion brought out the advantages and disadvantages of the different types of instruments.

A preliminary report on the butt-treating of cedar poles was read by L. R. Gamble, assistant engineer, The Washington Water Power Company. The importance of the subject was brought out by his statement that in 1920 only 43 per cent of the output of Western red cedar was treated, while in 1924, 90 per cent was treated, indicating a decided increase in the demand for treated poles. All the different methods of treatment were discussed with special reference to the specification "B" of the open tank impregnation method, which is one of the most common treatments used. He also described the belt, hammer and machine methods of perforating the fiber of the wood to increase the penetration of the preserving agent, giving greater efficacy to the treatment. Later, taking up the economics of the subject, he showed a simple method of determining on a given piece of construction how much difference in pole cost for treating the utility company might be justified in paying to obtain the lowest net cost, considering the interest, depreciation, operation and maintenance over the length of life of the line.

W. E. Melarkey, General Electric Company, San Francisco, showed a moving picture illustrating the operation of a new type of automatic supervisory equipment for controlling distant stations from a central dispatching station.

Accident Prevention Committee

The afternoon session opened with the report of the accident prevention committee with J. B. Fisken, chairman of the committee in the chair. In reviewing the deliberations of his committee he called attention to one of the commonest causes of accidents in many sections of this geographic division, namely, the moving of hay derricks under transmission lines. The committee had found that publicity was of little avail in coping with this hazard, and recommended that legislation be proposed of a nature to require the movers of hay derricks to conform to certain procedure intended to eliminate the possibility of accident. The committee also noted a growing hazard in the stringing and maintaining of radio aerials near power lines, and recommended legislation to combat this problem. A further recommendation was made to the effect that the public-relations departments of the various companies be advised of the opportunity existing for the dissemination of publicity warning of the dangers.

The committee took cognizance of a new class of accidents as represented by a case reported by the Idaho Power Company, Boise, in which an airplane was piloted into an 11,000-volt line. Among the recommendations of the committee was one advising against the use of pulmotors. These, the report said, are dangerous in the hands of persons unskilled in their use, whereas the Schaefer prone-pressure method of resuscitation can be learned readily by anyone and has been found to be more successful than any device or other method.

In a paper on the general subject of accident prevention, G. I. Drennan, field superintendent, Pacific Power & Light Company, Walla, Walla, Wash., declared that the best results in safety work were secured when the men were taught to work with safety in mind. He told of organizing committees in each place on his company's system where two or more men were working, and of these committees reporting monthly to him of their activities.

In the general discussion, D. W. Proebstel told of the efforts of the Portland Electric Power Company to induce police and fire departments and schools to teach the Schaefer method. T. G. Aston, claim, right of way and tax agent, The Washington Water Power Company, stated that the best protective devices are of no avail unless the men are trained in safety work. H. H. Sanderson, Sanderson Safety Supply Company, Seattle, displayed various safety appliances and protective devices that are on the market.

Meter Committee

In a paper on meter maintenance, methods and practices, R. E. Thatcher, superintendent of service, central district, Puget Sound Power & Light Company, chairman of the meter committee, touched on a variety of subjects, as, meter installation in city and country; testing instrument transformers; calibrating rotating standards and demand instruments; entrance switches and testing facilities; oil in meter bearings; and education of employees. An interesting development in metering was brought out when he explained the policy of his company in using polyphase meters for measuring 3-wire loads, because of the inherent inaccuracy of 3-wire meters under conditions of unbalanced voltage and overload.

In the discussion that followed, R. M. Freeman, meter supervisor, Pacific Power & Light Company, Walla Walla, Wash., laid emphasis on the necessity of having meter testers inspect the entire installation with a view to finding any irregularity. He stated that in checking for load ahead of the meter, connected load, meter constant, and such other items as might affect the billing of that customer's account, enough adverse errors in billing might be corrected to make meter testing pay for itself.

Prime Movers Committee

In opening the report of the prime movers committee, the chairman, O. L. LeFever, superintendent, Northwestern Electric Company, raised the question as to whether or not the companies in the Northwest might be overlooking the advantage of developing power by the use of low-grade coal at the mine mouth or nearby instead of going into expensive hydroelectric programs.

The powdered-coal situation was re-

Delegates and guests at second annual meeting of the Technical Section of the Northwest Electric Light and Power Association.

viewed and discussed in a paper by E. W. Seckendorf, steam department, central district, Puget Sound Power & Light Company, in which he stated that this fuel was used in 1924 to an extent nearly double that of 1923. Of the new furnace designs now in operation for the consumption of pulverized fuel, he described the well-type furnace with tangential jets producing a centrifugal burning action.

Tom Perry, superintendent of stations, Northwestern Electric Company, made a report of an investigation into the efficacy and use of the Jones self-lubricating bearing. This investigation disclosed the fact that the bearing was in use to a considerable extent in paper mills, among other places, and that where it had replaced the oil-ring type bearing on high-speed paper machines it had effected a material saving in power and oil. In the discussion on this subject, G. A. Frogner, Crown Willamette Paper Company, Portland, corroborated the statements made in the report and elaborated on them by citing his experience with the bearing in the paper industry.

A consideration of automatic-draft control for plants burning hog fuel was taken up by C. C. Simeral, assistant chief steam engineer, Portland Electric Power Company, who stated that the application of such draft control had not been in general use in the Northwest because until recent years high efficiency had not been required in hog-burning plants. Of the three types of automatic control described, that actuated by steam pressure, he said, gave the most positive control. The three advantages to be gained by the use of an automatic system are: increased efficiency, reduction in operation and maintenance costs and greater capacity.

In the discussion on the matters presented by the prime movers committee, C. E. Carey, engineering division, Westinghouse Electric & Manufacturing Company, Seattle, inquired whether it was not a mistake for Northwest companies, relying largely on hydroelectric plants for prime power, to spend the amount of money necessary to make their steam plants highly efficient when those plants are used largely as auxiliaries. His thought was that such plants operating a small proportion of the time should be built and operated as cheaply as possible.

Underground Systems Committee

Considerable discussion was launched by the paper on the possibility of an inexpensive underground distribution system, presented by R. S. Carroll, chairman of the underground systems committee. The paper described an underground system designed to serve a typical high-class residence district in which a large range load was contemplated, and it was shown that the system could be installed at a cost of 10 per cent over the cost of an overhead system. P. P. Ashworth objected to some of the wording of the report because it appeared to leave the way open for the public to demand underground systems everywhere. Mr. Carroll then pointed out that it should be understood that the companies could not install this kind of system everywhere, but contended that certain insistent demands would have to be met and that the companies should begin to prepare for these demands by a consideration of the subject presented.

The meeting closed with the offering of resolutions thanking the Davenport Hotel for the facilities provided; the Spokane daily papers for the publicity of the meeting; and The Washington Water Power Company for the arrangements made and for the entertainment extended to the visitors through trips to its various power plants.

Third Metermen's Course Held at University of Colorado

Thirty-two metermen from various points in Colorado and Wyoming attended the third annual metermen's short course given in the electrical standardizing laboratory of the University of Colorado under the auspices of the extension division March 23-27. The course was under the direct supervision of Prof. C. M. McCormick, in charge of the standardizing laboratory. Eight electrical manufacturing companies were exhibitors, and the equipment included several new machines which had not been seen previously in that section of the country.

Various phases of the metermen's work and problems were entered into, recent developments in equipment were discussed and several talks were given on general electrical subjects of interest to those in attendance. A number of interesting papers dealing with meters, relays and other subjects in connection with the metermen's work were presented during the school session.

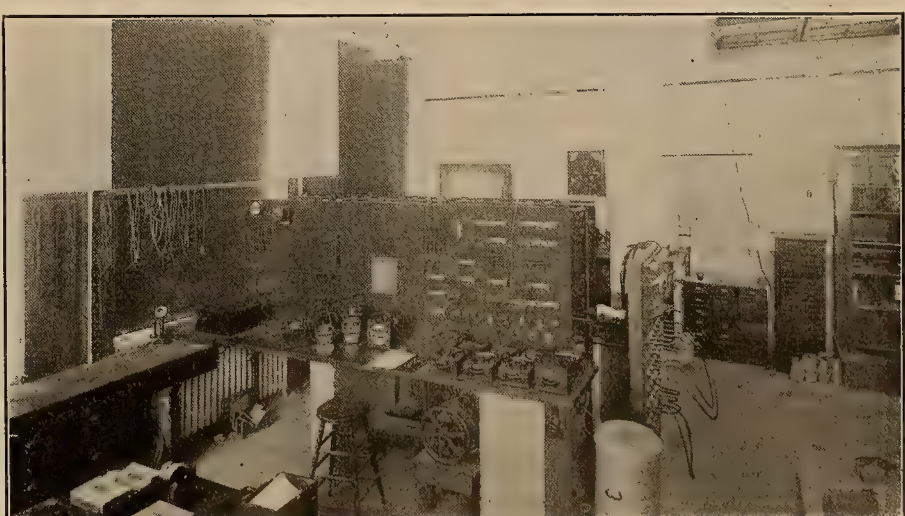
While guests at the university, the metermen were conducted on a general inspection tour, which included a demonstration and explanation of the electric pipe organ in Mackay Auditorium, one of the largest instruments of its kind in the country.

The party also inspected the new steam generating plant of the Public Service Company of Colorado four miles east of Boulder. Other features of the meeting were a demonstration of high-voltage testing, motion pictures on the electrical industry, demonstrations of radio equipment, and an inspection and explanation of the state oil laboratories maintained at the university.

Of special interest among the equipment displayed were a Cilbee current transformer testing set by Leeds & Northrup Company, Philadelphia, and a Westinghouse k.v.a. meter. Other exhibitors were: Bristol Company, Waterbury, Conn.; Superior Switchboard & Device Company, Canton, Ohio; Duncan Electric Manufacturing Company, Lafayette, Ind.; Sangamo Electric & Manufacturing Company, Springfield, Ill.; States Company, Hartford, Conn.; and the General Electric Company.

The course was the third of its kind to be given at the university. The attendance showed an increase of almost 50 per cent over 1924. Although the course was instituted as an experiment, its success has been such that it will be given each year hereafter.

New Street Lighting for Provo, Utah.—A new whiteway lighting system will be installed in the business district of Provo in the near future. Six blocks on Center Street have been created into a lighting district by the city commission by unanimous vote at its meeting on April 9.



Standardizing laboratory at the University of Colorado where the metermen's courses were held.

Information on N. E. L. A. Convention Transportation Presented

To assist delegates to the annual convention of the National Electric Light Association, to be held in San Francisco June 15-19, to visit some of the more important hydroelectric power developments of California, the convention transportation committee has issued information relative to the location of these installations. Under the listing prepared by the committee the name of the project, the railroad and route by which it may be reached, and the point for debarkation from trains has been given.

The list as prepared by the committee is as follows:

Pit River Development—Pacific Gas and Electric Company. Southern Pacific Company, Shasta Route, San Francisco to Portland. Debark at Redidng, Calif.

Big Bend and Cadibou Developments—Great Western Power Company. Western Pacific Railroad, Feather River Route, San Francisco to Salt Lake City. For Big Bend debark at Las Plumas, Calif., and for Caribou at Howells, Calif.

Kern River Development—San Joaquin Light & Power Corporation. Atchison, Topeka & Santa Fe Railroad or Southern Pacific Company, San Joaquin Valley Route, San Francisco to Los Angeles. Debark at Fresno, Calif.

Big Creek Development—Southern California Edison Company. Same as for Kern River Development.

O'Shaughnessy Dam, Hetch Hetchy Water and Power Development—City of San Francisco. One day trip from Yosemite Valley, Calif.

This list as prepared by the transportation committee is principally for the use of Eastern delegates who are not traveling on the Red Special, a train starting in and returning to the East. Other visitors to the convention must make out their itineraries, both to and from San Francisco, at the time of purchasing, if round trip rates are to be requested. Changes in routing will not be permitted after the trip has been started.

Four classes of delegates will attend the convention. All of these will be given the opportunity to take advantage of round-trip rates. The classifications as set up by the transportation committee are as follows:

Passengers on Red Special—Trip starts and ends in the East. All movement on special train.

One way special trains—Blue, Green and Orange Specials. This class of passengers will come to San Francisco on special trains, but will return as independent passengers. In purchasing round-trip tickets, entire routing must be designated. This is not subject to change after issuance of tickets.

Summer excursion tickets—Routes must be definitely determined before purchasing.

Reduced fares on certificate plan—Application has been made for reduced fares on the certicate plan from all points in California, Nevada, Oregon and Washington. Passengers must choose their route at time of purchase.

All round-trip tickets must be validated, and to assist the delegates in this, the transportation committee will maintain a booth in the Civic Auditorium where this may be done. Representatives of railroad companies also will be in attendance at the booth.

Fight on Denver Company's Bid for Franchise Continues

Considerable opposition still is being voiced against the franchise renewal of the Public Service Company of Colorado in Denver but the company is accelerating its effort in meeting all opponents. (Journal of Electricity, April 15, 1925, p. 284.) Officials of the company feel confident that a victory will be won at the city election, May 19. Principal causes of criticism up to the present have been the basing of rates on index cost figures of living compiled by the government and the fact that a longer period has not been provided for the preparation and study of the franchise submitted.

A bond issue for the municipal water plant and a franchise for a subsidiary of the Denver Tramway Company to operate motor buses on certain of the city streets also will be decided by the voters at the same time.

Electric Home to Be Displayed in Denver.—Another electric home is to be exhibited in Denver by the Electrical Cooperative League of that city. The home, an attractive Tudor bungalow, is located in the Washington Park district. The builder, E. S. Smith, plans to have the workmen off the job not later than May 15, and the league is planning to start the two-weeks demonstration several days later. One of the features of the home will be the lighting.

Navy's Largest Vessel Has Steam-Electric Power Plant

A steam-electric power plant of 140,000-kw. capacity will furnish the energy to drive the U. S. Navy's latest addition, the airplane carrier Saratoga. This ship recently was launched at Camden, N. J., and is the first of two originally designed to be the mightiest of battle cruisers and changed to serve the naval air service. The other, the Lexington, is to be launched this fall at Quincy, Mass. The modification of America's naval program, subsequent to the decisions reached at the conference on the limitation of armament, led to the conversion of these battle cruisers to airplane carriers. The Saratoga is 874 ft. long and 105 ft. abeam as compared to a length of 624 ft. and a beam of 97 ft. for the Maryland.

The combined ratings of the six electrically driven capital ships of the navy, California, New Mexico, Colorado, Tennessee, Maryland, West Virginia, are less than the rating of the single power plant of the Saratoga.

Four propellor shafts will be capable of driving the ship at the rate of 33 knots (39 m.p.h.). This is 12.6 knots in excess of the speed of the Maryland. Each shaft will be served by two motors, each rated at 22,500 hp. The generation equipment consists of four 35,200-kw. turbine generators. The power from this installation would be sufficient to supply completely the light and power demand of the city of Boston. The weight of the electric generation and propulsion machinery is 2,200 tons, and was supplied by the General Electric Company.

In addition to the main generating equipment there are six 750-kw., d.c., auxiliary turbine-generator sets which will furnish current for all electrical purposes other than main propulsion. Among the equipment so supplied are the steering gear, anchor windlass, ventilating fans and lighting systems.

The vessel carries no masts except a demountable radio mast. Of radio equipment, the Saratoga will have the last word as particular attention has been given to this item.

An immense clear, flat deck provides ample space for handling several planes, while the space beneath is so arranged that large numbers of planes can be stored, handled and repaired. Suitable hoisting equipment is provided to assure speedy handling. In order to maintain an unbroken expanse of deck the funnels are carried to the side of the ship.

Franchise Granted for Service in Woodland, Wash.—The city council of Woodland has granted to the Ridgefield Light & Power Company a 30-year franchise to sell energy in Woodland and to install the necessary equipment. It is stated that installation will begin within thirty days and be completed in six months. The Puget Sound Power & Light Company serves the city now.

One of the illuminated signs used by the British Columbia Electric Railway Company to stimulate the use of electricity and the use of streets cars in Vancouver. The board is 50x12½ ft. and is erected on a two-story building. The message on the sign is changed every two months.

Great Northern Is to Electrify 30 Miles of Main Line

Electrification of 30 miles of the main line of the Great Northern Railway Company will be started immediately, according to an announcement of Ralph Budd, president of the company. It is estimated that the electrification will entail an expenditure of $1,500,000.

Plans for the work have been completed, and contracts for the electric motors and locomotives required will be let shortly. It is planned to complete the work within ten months. The stretch between Skykomish, on the west side of the mountains, and Verne, the first station on the east side of the Cascade tunnel, will be electrified. This stretch includes the tunnel which is 13,873 ft. long. At the present time electric locomotives are used to haul the trains through the tunnel.

The capacity of the railroad company's 6,500-hp. hydroelectric plant in the Tumwater Canyon of the Wenatchee River will be increased to 10,000 hp. to supply the energy needed to haul trains over the addition to the electrified system.

Revision of Denver Electrical Code Has Been Started

Not to be outdone by other progressive cities in the revision of municipal electrical codes, the electrical industry in Denver, with the authorization and sponsorship of the city authorities, has started work by the appointment of a representative committee to assist C. F. Oehmler, city electrician, in bringing the 1922 code of that city up to date.

Present plans provide for the compilation of an entirely new code to include all the desirable features of the rules now in effect in Denver. With a view to the future, the committee plans to outline a code in loose-leaf form, one that will be perpetual rather than one which necessitates the publication of a new book with supplementary features each year.

According to reports, codes of twenty-five other cities are being studied and special consideration is being given to the Portland, Ore., regulations.

Members of the code revision committee are: C. F. Oehmler, chairman; W. W. Crocheron, manufacturers; J. D. Nicholson, jobbers; W. J. Guscott and C. G. Gramcko, contractors; C. B. Noxon, journeymen; L. A. Barley, underwriters; M. M. Koch, Public Service Company of Colorado, and S. W. Bishop, executive manager of the Electrical Cooperative League as secretary of the committee.

Manual for Employees Is Issued by Washington Utility

The Washington Water Power Company, Spokane, through its public relations department, has prepared for the information of its employees a manual in the form of a binder designed to hold twelve bulletins or chapters. The foreword states that it is felt all officers and employees can benefit much by the suggestions contained in the manual.

The book is prepared jointly with the National Electric Light Association, and it is suggested that full advantage be taken of the N.E.L.A. courses and other valuable information. Some of the subjects touched upon in the manual are: Growth of the Industry; Financing a Corporation; Non-Competitive Service; Regulation of Utilities; Political Ownership and Taxation; Relation of Employees to the Public; Qualifications and Work; Present Day Developments; Our Company and the Community.

To encourage employees of the company to read and study the manual the company has announced that two prizes will be awarded to employees who submit the best concluding chapter for the manual. The material is to be based upon that in the first eleven chapters. A first prize of $50 and a second of $25 will be awarded after the contest closes on May 16.

The Tale of a Cake Contest

By E. J.

In April San Francisco held
A Gas Appliance Week,
And many special features
The public's eye did seek.

Among them was a contest
To see who best could bake
In an up-to-date gas oven
A delicious, homemade cake.

After the judges had passed upon
All the cakes before their eyes,
Mrs. George W. Skipton's angel food
Was declared to have won first prize.

"In what model did you cook it?"
Her proud smile did not change—
"The prize-winning cake was baked," she said,
"In a Westinghouse electric range."

(Note: The rules which Mrs. Skipton read and under which she entered the contest did not specify the use of a gas range.)

Hydroelectric Power Plant to Be Erected at Oroville

Construction of a $350,000 power and irrigation plant in the Similkameen River at Oroville, Wash., will be started early in June or July by the Okanogan Light & Power Company of that town. E. J. Broderick, engineer for the company, states that the development involves the erection of a dam 200 ft. wide and 60 ft. high. It is planned to develop about 20,000 hp. at the site.

Incorporators of the company, which was granted a franchise recently covering power lines in the town of Oroville, are D. J. Broderick and Eugene Hockett, of Oroville and L. B. Stedman of Seattle. The company is incorporated for $100,000.

Stone & Webster Officials Visit Northwest.—Making a trip of inspection and study of business conditions in the Pacific Northwest, C. A. Stone, E. S. Webster, Frederick Pratt and Don Barnes, officials of Stone & Webster, Inc., of Boston, and Eastern financial agents for the Puget Sound Power & Light Company, recently visited Seattle and the Puget Sound country. While in Seattle the party inspected the properties of the Puget Sound Power & Light Company throughout the Northwest, and joined in the latter company's celebration of twenty-five years of public service in western Washington.

Natrona Power Company Bought by Byllesby Interests

The Natrona Power Company, Casper, Wyo., has been purchased by H. M. Byllesby & Company, according to a recent announcement by J. J. O'Brien, president of the latter company. It will be operated as the Wyoming division of the Mountain States Power Company, Albany, Ore., also a Byllesby property.

The Natrona company has three steam electric power plants with a combined capacity of approximately 7,000 hp., and more than 71 miles of high-tension transmission and distributing lines serving electric power and light to 6,727 customers in Casper, Mills and Evansville. Its gross earnings for 1924 amounted to $557,805 and net earnings to $249,369.

Casper, the site of the power plant, is the center of the Wyoming oil industry and the largest city in the state, having an estimated population of 32,276. It is also a division point of the Chicago, Burlington & Quincy and Chicago & Northwestern Railroads.

Investigation of Electric Rates in San Francisco Asked

An investigation of electric rates charged by the Pacific Gas and Electric Company and the Great Western Power Company in San Francisco is asked in a resolution presented to the board of supervisors of that city April 27, 1925, and referred to the public utilities committee of the board for recommendation. The resolution also asks the city attorney to take the necessary steps before the California State Railroad Commission to bring about a reduction in rates.

The resolution cites the reports presented by the two companies to the Railroad Commission, pointing out that the Pacific Gas and Electric Company derived 34 per cent of its gross revenue from the sales of 27.9 per cent of its energy in the city during 1924. In the same period the Great Western Power Company is said to have sold 23.4 per cent of its power in San Francisco and derived 36 per cent of its gross revenue therefrom. The resolution further declared that the average retail kw-hr. charge in San Francisco of 3.68 cents is 50 per cent higher than the average retail charge to consumers on other parts of the system.

Lighting Bulletin Issued by Westinghouse Company.—"Lighting the Home," Lighting Bulletin E-105 of the Illumination Engineering Bureau of the Westinghouse Companies, issued by the Westinghouse Lamp Company, New York, contains many valuable recommendations for lighting the home. In the beginning it gives a wiring plan for a typical modern home, both first and second floors, and follows this with recommendations and suggestions for lighting the living room, sun porch, dining room, breakfast room, kitchen, halls and entrances, bedrooms, sewing room, bathroom, laundry and basement, and garage and workshop. Accompanying the suggestions for each room are photographs of lighting arrangements, a wiring diagram, illustrations of types of luminaires and styles of Mazda lamps. The rest of the bulletin is devoted to selection of Mazda lamps for home lighting, and wiring for the home.

News of the Electragists

Electragists to Hold Quarterly Meeting in Visalia

Everything is in readiness for the quarterly meeting of the California Electragists to be held at the Hotel Johnson, Visalia, Saturday, May 9, 1925. An interesting program has been arranged by Walter F. Price, executive secretary. The details of the unified body of California Electragists will be explained. A number of the members of the southern division are planning to be present at this time to become more familiar with the methods used by those in the northern division. The executive committee will meet at 9:30 a.m. Saturday, and the general open meeting will be held at 1:30 in the afternoon.

Special Pullman cars will be attached to the Southern Pacific train to accommodate those leaving from the Bay district. The ferry which leaves San Francisco at 11:40 p.m. Friday night will connect with this train, which will arrive in Visalia at 8:50 a.m. The train will leave Visalia at 8:00 p.m. Saturday and arrive in San Francisco at 8:10 Sunday morning.

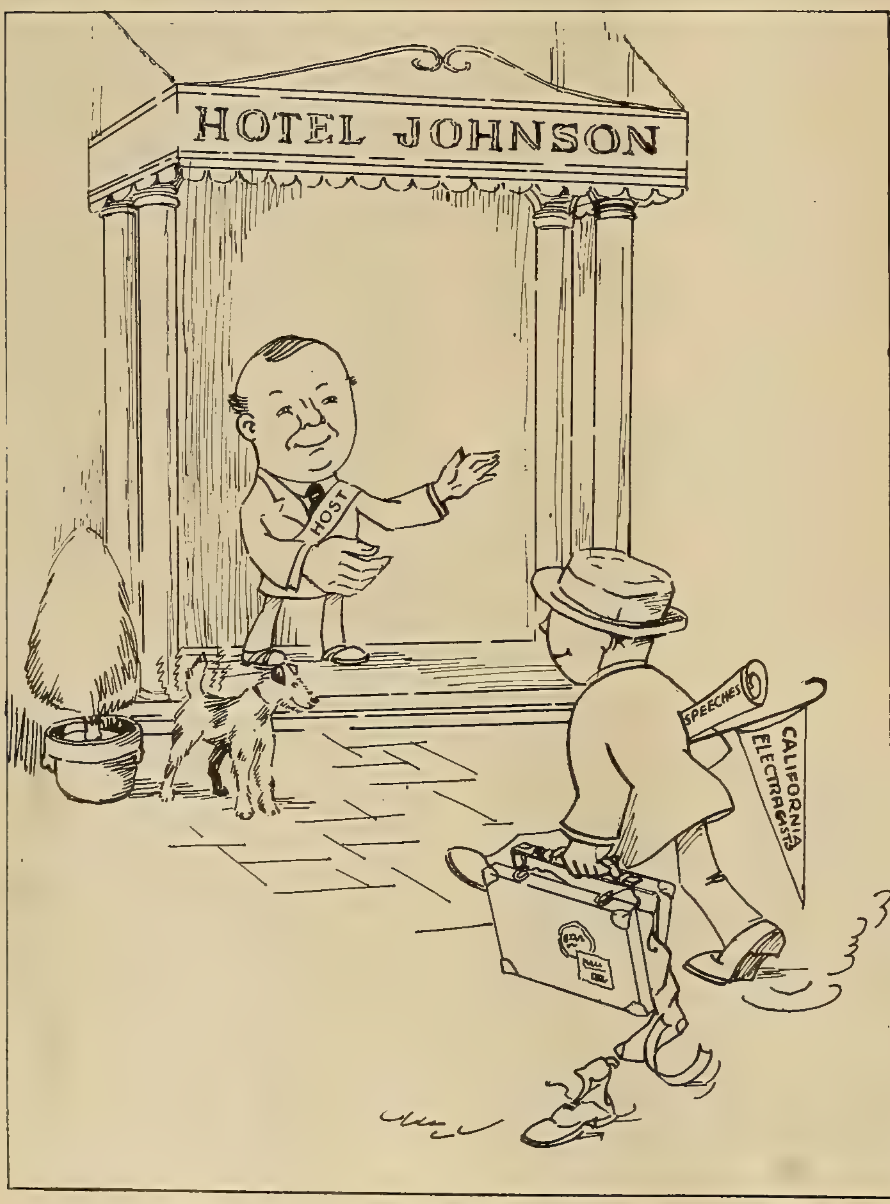
Name Adopted by Association at Recent Meeting at Napa

The "Tri-County Electrical Development League" was the name chosen at the last meeting of the recently formed association of electrical contractors and dealers of Napa, Solano and Sonoma Counties, Calif. The meeting was held at the Brown Hotel in Napa and was presided over by President Earl Wilson, electragist of Napa.

The principal speaker of the evening was R. A. Balzari, of the Westinghouse Electric & Manufacturing Company of San Francisco, who addressed the meeting on the benefits to be derived from applying courtesy in business. Short talks also were made by LeRoy H. Crandall, California Electrical Bureau, and Roy Dryer, Western Electric Company, both of San Francisco.

Future meetings will be held on the second Thursday of each month, at a place to be named by the program committee.

A. B. Campbell Electric Company, Orland, is among the recent firms to become members of California Electragists.



Where the Electragists will be May 9.

Book Reviews

ELECTRICAL DRAFTING AND DESIGN

By CALVIN C. BISHOP. 165 pages, 65 figures, 73 tables and charts. $2. Published by McGraw-Hill Book Company, New Yorfl, N. Y.

Comparatively few books have been published on the subject of electrical drafting and most of these have been of a rather elementary character. This book, according to the author, attempts to bridge the gap between the usual course in mechanical drafting as taught in technical and vocational schools and the work required in the office of an engineer, a contractor, or a power company.

The problems throughout are of a practical nature and the treatment of them is similar to the manner in which they would be handled in an office. No attempt has been made to go into the design of electrical machinery but rather the application of such machinery and particularly the layout of the wiring involved is considered.

After an introductory chapter on general instructions for mechanical and electrical drafting, chapters follow on the subjects of electrical symbols and their use; design of generator and feeder panels; 3-phase panels and outdoor substations. Two chapters are devoted to wiring under the subjects of laying out wiring and residence wiring, followed by a chapter on artificial illumination.

About one-half of the book contains tables and charts covering standard equipment with the data and dimensions necessary for the designer when this equipment is incorporated in the design of electrical installations.

The subject is handled throughout the book in a clear and logical manner and no doubt will serve the purpose of bridging the gap between a course in mechanical drafting and drafting room work as handled in the office of an engineering firm. However, the book would be more valuable if the subjects were treated in somewhat greater detail, particularly in the chapters on generator panels and outdoor substations.

At the end of a number of chapters lists of problems are given which should assist the student in obtaining practice in the problems which he may expect in an engineering drafting room.

E. R. S.

Meetings

Northwest Association Public Relations Section Meets

At a meeting of the executive committee of the Public Relations Section of the Northwest Electric Light & Power Association, at Seattle, April 3, a number of reports of subcommittees were heard and discussion had on many subjects related to section activities. W. H. Ude, director of public relations, The Washington Water Power Company, Spokane, chairman of the committee, presided over the meeting, which was attended by six committeemen and eight others associated with public relations work.

H. J. Gille, sales manager, Puget Sound Power & Light Company, reported on the activity of the Washington Committee on the Relation of Electricity to Agriculture, stating that plans are under way for carrying on this summer a survey of farming districts of Washington similar to the survey conducted last year by the Oregon committee in that state. E. H. Thomas, director of the Washington Committee on Public Utility Information, Seattle, reported for the committee on cooperation with educational institutions; H. Peets, public relations department of the Puget Sound Power & Light Company, reported for the customer-ownership committee, and L. A. McArthur, vice-president and general manager, Pacific Power & Light Company, reported for the committee on public speaking. Other subjects discussed were: Farm electrification, beautification of grounds, getting information printed in the press, and radio interference.

Mrs. L. A. McArthur, who was present, was chosen to head the women's public information committee of the Northwest association. This committee is new to this geographic division, and it is expected will be effective in spreading information about the public utility business through women employees and wives of employees of the various companies. The personnel of this committee has not been appointed.

Officers of Long Beach Electric Club Announced

The Electric Club of Long Beach, W. Lane, electrical contractor; first vice-president — T. R. Reid, electrical contractor; second vice-president—R. B. Farley, district superintendent, Southern California Telephone Company; secretary and treasurer—V. L. Ringle, Southern California Edison Company; sergeant at arms—Clyde Baty, electrical contractor.

Committee chairmen appointed are: Entertainment—J. C. Kyle; membership—W. D. Phillips; publicity—F. D. Stuthman, all of the Southern California Edison Company; public policy—L. B. Marsh, electrical jobber; visiting and relief—E. B. Cummings, assistant district manager, Southern California Edison Company. R. W. Abright, city electrician-inspector, is parliamentarian and William Shipp, electrical contractor, is trustee of committees.

Brigham City Men Make Visit to Cutler Power Plant Site

Several automobile loads of business and professional men from Brigham City, Utah, visited the site of the Utah Power & Light Company's new hydroelectric development at Cutler on April 3. At the time of their visit about 250 men were employed in the preliminary work of excavating, grading and erecting new buildings which will be a part of the construction camp.

The visitors were received by L. B. Fuller, who has charge of the work, and were informed as to the company's plans in connection with the project. A great amount of interest is being manifested by the citizens of the section in which the new plant is to be located, and already many visitors have been welcomed.

Electric Truck School to Be Held in San Francisco

The National Electric Light Association will conduct an electric truck school in San Francisco, June 8-13. The faculty will be composed of men from the East headed by E. S. Mansfield of the Edison Electric Illuminating Company of Boston, who is chairman of the truck school committee of the N.E.L.A.

An invitation is extended to anyone interested in electric truck transportation to attend these sessions. Those intending to be present are asked to send their names to John L. Farley, Pacific Gas and Electric Company, San Francisco.

COMING EVENTS

Southwestern Public Service Association—
Annual Convention—Rice Hotel, Houston, Texas
May 5-8, 1925

Pacific Coast Electrical Supply Jobbers' Association—
Quarterly Meeting. Arlington Hotel, Santa Barbara, Calif.
May 7-9, 1925

Electrical Supply Jobbers' Association—
Annual Convention—Hot Springs, Va.
June 1-6, 1925

Associated Manufacturers of Electrical Supplies—
Annual Meeting—Hot Springs, Va.
June 8-13, 1925

Northwest Electric Light and Power Association—Annual Convention —
Gasco Building, Portland, Ore.
June 12, 1925

National Electric Light Association—
Annual Convention—San Francisco, Calif.
June 15-19, 1925

Seattle Club to Hold Golf Tournament.—The Electric Club of Seattle has formulated plans for a proposed golf tournament, the second annual affair of this nature conducted by the club. Play will begin not later than May 1, and about 60 men of the organization are expected to participate, with first and second flight. There will be two sets of prizes, besides the President's Cup, donated by H. J. Martin, president of the club, and won for the first time by J. C. Zancker of the Western Electric Sign Company. This cup must be won three times to be retained. The committee in charge of the proposed tournament is H. J. Martin, Earl Peterson of the Westinghouse Electric & Manufacturing Company, and J. J. Agutter of the J. J. Agutter Company.

Pacific Power & Light Company Holds Managers' Meeting

As part of the public relations work of the Pacific Power & Light Company, Portland, L. A. McArthur, vice-president and general manager, recently called together all the district managers and heads of departments for a two-day meeting at Walla Walla, Wash. The following, in addition to Mr. McArthur, were on the regular program for talks on subjects pertaining to different phases of relations with the public: Will T. Neill, superintendent of rates and service; G. C. Sawyer, sales manager; S. E. Skelley, manager of investment department; and George L. Myers, assistant to the president.

In addition to the regularly scheduled talks, there was discussion by all present on ways and means of presenting company affairs properly to the public. One of the features of the meeting was a session for the women, both employees and wives of employees, presided over by Mrs. L. A. McArthur, at which each woman present told what she could do or had done to further the interests of the company among her circle of friends and acquaintances.

Industrial Heating School for San Francisco June 9-13

The Pacific Coast Electrical Association will conduct an industrial heating school in San Francisco June 9-13. It will be under the supervision of the Westinghouse Electric & Manufacturing Company, which will have charge of the school in this geographical division of the National Electric Light Assocation. The instructors for this school will be Pacific Coast men, G. A. Reed, vice-chairman of the committee, being in direct charge.

The first three half-days will be devoted to lectures and general discussion of industrial heating problems. The next three half-days will take up specific applications with special reference to Pacific Coast conditions. The final period of three half-days will be used to inspect equipment displays of manufacturers and in making inspection trips to different industries.

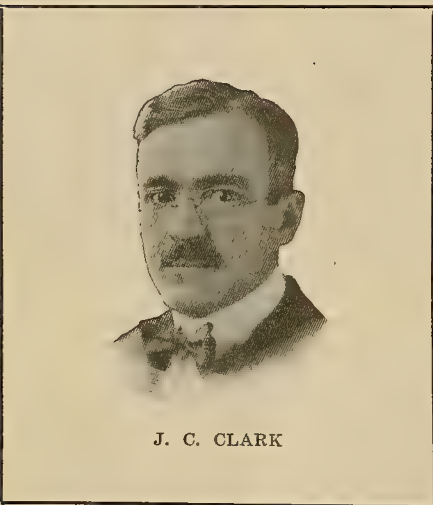
All interested in this field are invited to the meetings. Those expecting to attend are asked to send their names to John L. Farley, Pacific Gas and Electric Company, San Francisco.

Utah Engineer Talks on Cutler Project.—J. R. Jarvis, superintendent of lines and service in the Ogden division of the Utah Power & Light Company, was the principal speaker at the monthly meeting of the Ogden chapter of the American Association of Engineers, held at Ogden, Utah, on the evening of March 21. Mr. Jarvis described in considerable detail the main features in connection with his company's new hydroelectric project, upon which work is now starting at Cutler on the Bear River. He also discussed the company's Bear Lake and Bear River system.

Japanese Steam Plant Completed.—The first unit of the Amagasaki steam plant of the Nippon Electric Power Company was completed about the end of last year and immediately put into operation. It will develop 25,000 kw. The ultimate capacity of the plant will be 50,000 kw.

Personals

J. C. Clark, formerly professor at Iowa State College in charge of electrical engineering research, recently resigned to join the sales engineering staff of the Pacific Electric Manufacturing Company of San Francisco, designers and builders of oil circuit breakers and other high-voltage line equipment. Prior to his association with the Iowa State College research department Mr. Clark was a member of the staff at Stanford University, Palo Alto, Calif., where for twelve years he had been identified with the high-voltage research carried on there. Mr. Clark has taken an active part in the affairs of the American Institute of Electrical Engineers, being a past chairman of the San Francisco Section. He is an alumnus of Harvard University and of Iowa State College. He brings a wide knowledge and a varied and extensive experience in practice to his new position.


J. C. CLARK

J. A. Gelzer, for many years connected with the automotive sales department of the Wagner Electric Corporation, St. Louis, has been appointed sales manager of the automotive division of that company with headquarters at the home office.

Paul Overton, of the Southern California Edison Company, Los Angeles, was a recent visitor in San Francisco.

A. C. Joy of the publicity department of the San Joaquin Light & Power Corporation, Fresno, Calif., was a recent visitor in San Francisco.

Harry D'Almaine has been appointed district manager for Charles Cory & Son, Inc., New York, in charge of the Chicago branch at 22 West Quincy Street. He will handle also the marine equipment business for ships' signaling, communicating and lighting equipment on the Great Lakes.

D. S. Jones, Center, Colo., was appointed a member of the Colorado public utilities commission to succeed **Grant Halderman**, who has completed his term.

Felix Van Cleef, Van Cleef Brothers, Chicago, was a recent visitor to the Pacific Coast, spending considerable time in San Francisco.

J. M. Lafflin, chief clerk at Walla, Walla, Wash., for the Pacific Power & Light Company, Portland, has resigned to take up his residence on his berry ranch at Shelton, Wash. His resignation has been made the occasion for the promotion of the following chief clerks: **H. M. Dunkelberger**, from Astoria, Ore., to Walla Walla; **W. L. Parkhurst**, from The Dalles, Ore., to Astoria; **L. V. Stram**, from Waitsburg, Wash., to The Dalles; **J. K. Bokius**, from Goldendale, Wash., to Waitsburg; **E. G. Richards**, from White Salmon, Wash., to Goldendale.

A. F. Henderson, assistant to comptroller, Puget Sound Power & Light Company, Seattle, was transferred on April 1 to the Boston office of Stone & Webster, Inc. His place in Seattle has been filled through the appointment of **D. J. Torrance.**

J. P. Davidson, Pacific Coast representative of the Estate Stove Company; **C. B. Nelson**, supervisor, Estimates and Records, Pacific Gas and Electric Company; **A. G. Smith**, personnel department, Pacific Telephone & Telegraph Company, and **R. T. Stephens**, manager electric sales, Pacific Gas and Electric Company, were among the new members present at the recent meeting of the San Francisco Electrical Development League.

H. E. Leigh, Denver, Colo., has been made manager of the Westinghouse department of the Mine & Smelter Supply Company in that city. He succeeds **Thomas Yonley**, who has resigned to become actively associated with the Westinghouse company in Indianapolis.

George E. Tribble has been appointed regional director for the Electric Vacuum Company, Inc., Cleveland, with headquarters at 575 Mission Street, San Francisco.

Harry G. Holabird, for many years representative of the Ohio Brass Company, Mansfield, Ohio, has severed his relations with that company to go into business for himself as manufacturers' agent. He has established quarters at 451 East Third Street.

A. H. Holtermann of Holtermann's Electric Shop, San Francisco, will operate the wholesale department of that business under the name of "A. H. Holtermann, Manufacturers' Representative," with headquarters temporarily at 89 Market Street.

Giles Hunter, recently employed in the accounting department of the Tacoma Railroad & Power Company, Tacoma, has moved to Bellingham, where he will be assistant chief clerk of the northern district of the Puget Sound Power & Light Company, Seattle.

C. H. Hagey, of the protection engineering department of the Southern California Edison Company, Los Angeles, was recently designated as supervisor of the eastern and southern divisions. **G. H. Whitney** of the same department has been appointed supervisor of the northern and western divisions. These men will thus be directly responsible for the satisfactory operation of all relays and other protective equipment within their divisions of the system.

Lee Bennett, for some years manager of the Sandpoint, Idaho, division of the Mountain States Power Company, Albany, Ore., recently has been promoted to be local manager at Corvallis, Ore., taking the place of **F. E. McKenna** who has been transferred to Albany as sales manager.

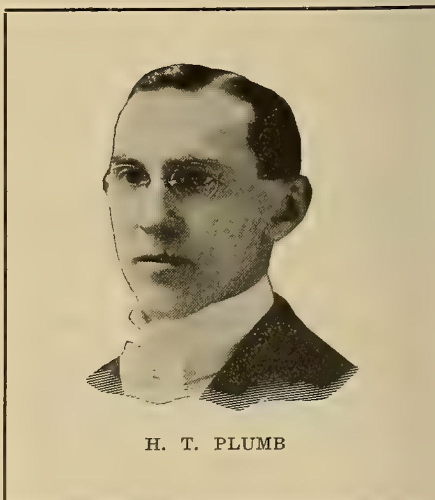
C. E. Skinner, assistant director of engineering, Westinghouse Electric & Manufacturing Company, Pittsburgh, attended the meetings of the International Electrotechnical Commission held at The Hague, Holland, April 16 to 24, inclusive.

H. C. Bernsten, vice-president, Lockwood-Shackelford Company, Inc.; **R. M. Kerschner**, manager Hubbard & Company, and **John D. Trapp**, salesman, Alexander & Lavenson Electric Supply Company, recently have become members of the San Francisco Electrical Development League.

H. N. Porter recently has been appointed sales manager for the States Company at Hartford, Conn.

W. D. Ward, representing the New York office of the Pelton Water Wheel Company, was a recent visitor in San Francisco.

H. T. Plumb, electrical engineer connected with the Salt Lake City office of the General Electric Company, is among the forty-three employees of the company to be honored with awards given workers under the Charles A. Coffin foundation for the year 1924. Mr. Plumb has been with the company fourteen years. When the disaster occurred at the Castle Gate coal mine at Castle Gate, Utah, in which an explosion resulted in the death and injury of a large number of miners, Mr. Plumb went to the scene of the disaster and helped with the rescue work for six days. He initiated a systematic direction of the work at the mine portal through which bodies were brought from the mine, and organized a telephone service for rescuers in the mine. He took charge of the supplies, kept a record of telephone conversation from the rescue workers, and directed much of the work in the mine by telephone. It was because of this service to a customer in time of disaster that the award was made him. In addition to the Coffin certificate he was given $250 in General Electric Employees Securities corporation bonds, bearing 8 per cent interest. Mr. Plumb is well known in the electrical industry and has taken an active part in its affairs. He is a past president of the Utah Society of Engineers, and in 1921 acted as general chairman of the committee in charge of the annual A.I.E.E. convention held in Salt Lake City in that year. He is a graduate of the University of Wisconsin and was formerly professor of electrical engineering at Purdue University.


H. T. PLUMB

A. E. Wishon, who has been general manager of the San Joaquin Light & Power Corporation, Fresno, Calif., since 1920, recently assumed additional responsibilities as vice-president of the company when he was elected to that position following the acquirement of control of the San Joaquin company by the Western Power Corporation of New York. In addition to his many duties in connection with the Fresno utility, Mr. Wishon always has taken a prominent part in the affairs of the electrical industry and has given much of his time to its development and progress. He has been particularly active in Association work. He served as president of the Pacific Coast Section of the National Electric Light Association for the term 1919-1920, and in 1922 was appointed chairman of the committee on amendments to the constitution of the Pacific Coast Electrical Association, as the Pacific Section had been named. At the present time he is chairman of the customer-ownership committee of the National Electric Light Association and a member of the Public Policy Section of the Pacific Coast Electrical Association. The San Joaquin Light & Power Corporation has pursued the policy of customer-ownership with marked success, and the subject is one in which Mr. Wishon is deeply interested. He recently delivered an address, "Now and Tomorrow with Customer-Ownership," at the semi-annual meeting of the Academy of Political Sciences in New York.

A. E. WISHON

W. H. McGrath, vice-president of the Puget Sound Power & Light Company, Seattle, recently returned to his desk after a short sojourn in California.

H. C. Ross, Pacific Gas and Electric Company, Fresno, Calif., was a recent visitor in San Francisco.

J. J. Gibson, vice-president, Westinghouse Commercial Investment Company, New York, spent several days in Seattle recently inspecting the company's properties in that city.

J. C. Clark, sales engineer, Pacific Electric Manufacturing Company; **L. H. Jetton,** telephone engineer, Pacific Telephone & Telegraph Company; **E. H. Kinney,** supervisor shops and vehicles, Pacific Telephone & Telegraph Company; and **L. S. Newell,** manager and buyer, Dunham, Carringan & Hayden, recently have been added to the membership roll of the San Francisco Electrical Development League.

J. S. Lapp, general manager of the Lapp Insulator Company, Le Roy, N. Y., manufacturers of Lapp high-tension porcelain insulators, recently visited the Pacific Coast on a tour of inspection of local conditions. While on the Coast Mr. Lapp gave a series of illustrated lectures to engineers on the subject of high-tension porcelain insulators in Seattle, Portland, San Francisco and Los Angeles. He was assisted by his Coast representative, **S. H. Lanyon,** New Call Building, San Francisco.

H. E. Baker, district manager at Hood River, Ore., for the Pacific Power & Light Company, Portland, has been given charge of the White Salmon, Wash., district, formerly operated under a separate district organization. The new Hood River-White Salmon bridge crossing the Columbia River at this point has made possible the consolidation of the two districts under one organization.

D. C. Green, vice-president and general manager of the Utah Power & Light Company, has been elected a director of the Utah Associated Industries.

H. A. Wagner, president, Consolidated Gas, Electric Light & Power Company, Baltimore, and organizer and first president of the Wagner Electric Manufacturing Company, St. Louis, Mo., has been elected a director of The Society for Electrical Development to represent central station interests.

L. F. Hunt, formerly of the protection engineering department of the Southern California Edison Company, Los Angeles, has been appointed development engineer.

Harold J. Payne, formerly of the editorial staff of Chemical and Metallurgical Engineering, New York, has joined the staff of The Society for Electrical Development. His work will be in connection with promoting the use of electric trucks both for delivery work and in the industrial field.

H. H. Jones, vice-president in charge of operations of the Northern States Power Company, Minneapolis, Minn., and formerly president and general manager of the San Diego Consolidated Gas & Electric Company, was a recent visitor in his former "stamping grounds," San Diego.

W. F. Raber, general manager of the San Diego Consolidated Gas & Electric Company, returned recently from a trip to Chicago where he attended the annual meeting of the board of directors of Standard Gas & Electric Company.

F. Harold Smith, Westinghouse Electric Company, Los Angeles, was in San Francisco recently.

C. O. Woodworth, formerly of the Spinney-Woodworth Company, Denver, has withdrawn from the company and become associated with Harry Schockett of that city.

G. E. Boreham, until recently chief electrician U. S. A. Quartermaster Department, Fitzsimmons General Hospital, Denver, has been transferred to the U. S. V. B. Hospital No. 102, at Livermore, Calif., in the same capacity.

C. Reeves has been sent to Denver by the Edison Lamp Works of the General Electric Company to assist George **O. Hodgson** district sales manager of that company in the Rocky Mountain region.

M. M. Johnson, Hubbard & Company, Pittsburgh, was a recent visitor in Salt Lake City.

H. Anderson, district manager at White Salmon, Wash., for the Pacific Power & Light Company, Portland, has been promoted to that position at Prosser, Wash., taking the place of **J. C. Gest,** who has joined the merchandise sales department of the company with headquarters at Lewiston, Idaho.

Ted Nollenberger, of the electrical contracting firm of Nollenberger & Dorner, Denver, is conducting the business solely, the partnership having been dissolved.

C. L. Lewis, general manager of the Electro-Kold Corporation of Spokane, recently made an extensive tour of Pacific Coast cities, visiting all the important points.

D. C. Jackson, formerly sales manager, Dudlo Manufacturing Corporation, Fort Wayne, Ind., has joined the staff of A. S. Lindstrom, San Francisco.

Obituary

R. E. Gorton, manager of the Packard Lamp Division, National Lamp Works of General Electric Company for the past fifteen years, died April 13 after a brief illness at his home in Warren, Ohio. Mr. Gorton was one of the pioneers in the incandescent lamp industry, having entered it in 1894.

Joseph Schoemer, president of the Seattle Lighting Fixture Company, prominently identified with this branch of the electrical industry for the past twenty years, died in Seattle on April 11.

C. O. Poole, identified with hydroelectric construction in California for the past twenty-five years, died in Los Angeles April 2. He was born in Salisbury, Mass., in 1859, coming to the Pacific Coast in 1883 to take up engineering work. In 1900 he was in charge of construction on the first high-tension transmission line built into San Francisco. Four years later he became chief engineer of The Southern Sierras Power Company, Riverside, Calif., and allied companies, and for twenty years was active in field service. In 1924 he resigned to become consulting engineer of the organization, retaining that position until the time of his death.

C. O. POOLE

TRADE NOTES

General Electric Company, Schenectady, has announced recent issuance of an attractive booklet entitled "Switchboards in Architecture," containing twenty-two pages of reprints of advertisements and other data of value to those planning installation of switchboards in building structures.

Pass & Seymour, Inc., Syracuse, N. Y., claims that by adding a metal locating lug to all P.&S. porcelain socket bodies, with the single center screw, a saving of time for the wireman in assembling these wiring devices is assured. The metal lug on the body fits a corresponding depression in the caps and bases and indicates the position for assembling. They are also exploiting a new brass shell socket for gas-filled lamps, known as the P.&S. super standard key socket.

Harvey Hubbell, Inc., Bridgeport, Conn., recently has brought out a new device which converts a single convenience outlet into a duplex. It has the advantage of being exceptionally small and fits snugly up against the outlet plate.

Westinghouse Electric & Manufacturing Company recently has developed a new leakproof sleeve bearing for electric motors, designed to prevent the leakage of oil into the windings or the entrance of dust and grit into the bearings. It is known as the Sealed-Sleeve bearing and is claimed to be so constructed that is is almost airtight, preventing air from getting in and oil from leaking out.

General Engineering & Supply Company, New York City, recently has issued Bulletin Q 48, describing the "Gesco Portable," its new powerful high-frequency machine.

The Okonite Company, Passaic, N. J., has announced the opening of a sales office in St. Louis at 444 Frisco Building. It will be in charge of L. R. Mann.

Sangamo Electric Company, Springfield, Ill., announces the development of a maximum-demand attachment for use on its horizontal polyphase watthour meters.

P. A. Geier Company, Cleveland, recently has published a new booklet entitled "For Health, Strength and Beauty," that contains much useful information on vibratory massage and the Royal electric vibrator. The booklet is offered to the trade for free distribution.

Wagner Electric Company, St. Louis, has issued recently Bulletin No. 142, as well as Bulletins 63 and 64, which are small pocket-size editions, entitled Ward Leonard Vitrohm Resistor Units and Motor Starters and Controllers for Alternating Current.

Cutler-Hammer Manufacturing Company, Milwaukee, has announced the development of a new line of starters for use with Fynn-Weichsel motors.

Wheeler Reflector Company, Boston, recently placed a new device on the electrical market, known as the Wheeler K-7, a non-breakable porcelain enameled steel reflector designed for use with 75, 100 and 150-watt lamps.

The Square D Company, Detroit, has announced a new power panel construction embodying several new features in panel board design.

Haag Brothers Company, Peoria, Ill., recently has introduced a new washing machine under the name "Vortex," which it is offering to the trade at a list price of $125. This machine has many new features, it is claimed.

The Divine Electric Shop, Sumner, Wash., was completely destroyed in a recent fire, with a loss of approximately $10,000. Clarence E. Divine, the owner, has opened a new shop in the Althen Block.

Herman H. Sticht & Company, New York City, have announced their Bulletin No. 135, "The '2 in 1' Megohmer," descriptive of its instrument for resistance, insulation or voltage measurement.

"Newt" Graham, of the Los Angeles firm known as Graham Reynolds Electric Company, sure "socks" a mean "apple" when he gets on the golf course. The photographer intended to catch "Newt" in the middle of his swing at the brand new pellet he was giving a personally conducted tour of the Del Monte links, but due to the speed of the golfer, "Newt" was almost through with work of getting distance and accuracy when the shutter clicked. Incidentally, the drive was a peach.

W. A. Jones Foundry & Machine Company, Chicago, announces that its new General Catalog No. 30 is now ready for distribution. The catalog contains 448 pages of data on power transmission machinery.

The Yale Radio Electric Company, electric and radio jobbers, has moved into its new building at 1111 Wall Street, Los Angeles. The concern was situated at 4816-18 South Vermont Avenue, Los Angeles.

Hisey-Wolf Machine Company, Cincinnati, recently has reduced its price on all electric tools.

Holophane Glass Company, New York, recently has developed a new type of reflector, designed for 75,100 and 150-watt lamps. It is claimed to be especially suitable for the illumination of aisles between compartments in substations and an admirable example of how asymmetric light distributions may be moulded to fit specific types of interiors so as to give the greatest possible utilization efficiency of the generated light.

Condit Electrical Manufacturing Company, South Boston, invites attention to its N4 oil motor starter arranged for thermal cutouts, described in detail in their recently issued industrial handbook.

George A. Gray Company, with offices in San Francisco and Los Angeles, has secured the agency for the eleven Western states for the Appleton Rubber Company, Franklin, Mass., manufacturers of the O. K. brand friction tape and splicing compounds.

Crocker-Wheeler Company, Ampere, N. J., recently has developed a new remote control starter for squirrel-cage induction motors.

Appleton Electric Company, Chicago, has opened a branch office and warehouse at 340 Azusa Street, Los Angeles, where it states it will carry a complete stock of all Appleton electric products. The office will be in charge of D. G. Welling, and W. S. Sweet will act as his assistant. B. A. Wagner of the Electric Agencies Company of San Francisco will be in charge of the northern California business.

Brown Instrument Company, Philadelphia, recently has issued catalog No. 32, entitled "Measuring CO_2 Electrically." The catalog is well illustrated with drawings and photographs.

George W. Dunham Corporation, Utica, N. Y., recently has placed a new electric washer on the market known as the Whirldry Washer, which is of the centrifugal drying type. The company claims the tub has many new and advantageous features.

Wagner Electric Corporation, St. Louis, recently has issued an attractive illustrated booklet depicting its newest fans and their special features.

Curtis Lighting, Inc., Chicago, recently has prepared a new catalog covering the latest designs in church lighting. It also shows new types of office fixtures.

Sundh Electric Company, Inc., of Newark, N. J., has issued recently a descriptive bulletin covering its line of equipment. The bulletin is well illustrated with diagrams and drawings.

Buffalo Gas Radiator Corporation, North Tonawanda, N. Y., recently has issued a new circular describing its Niagara electric steam radiators.

U. S. Electrical Manufacturing Company, San Francisco and Los Angeles, has announced a new U. S. automatic-start motor, which is an improved self-starting motor with no moving parts. A pamphlet describing this motor contains photographs and diagrams and may be had on application.

Fulton Iron Works Company, St. Louis, has issued recently for general distribution on request the Fulton-Diesel Bulletin No. 807 on the Diesel Engine in medium powered central stations.

The Gordon Radio & Electric Company, Seattle, will move to new and larger quarters at 1610 Fourth Avenue.

McGraw-Hill Publication
San Francisco, Calif.

N. E. L. A. Convention
San Francisco—June 15-19

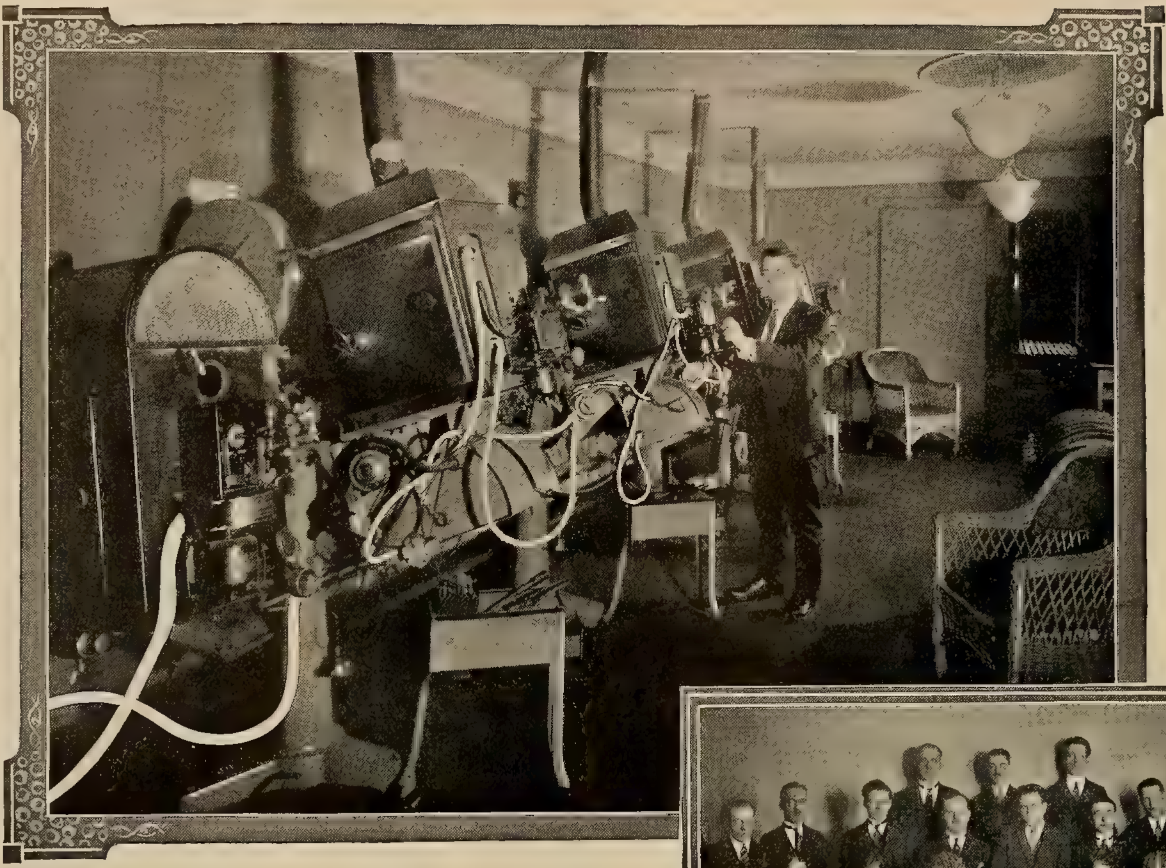
May 15, 1929
25 Cents

Journal of Electricity

Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES

ROCKBESTOS

–the asbestos covered wire



Projection room of Capitol Theatre, showing Rockbestos Motion Picture Cable on Projectors.

Is used in the Capitol Theatre, New York—made famous by "Roxy and his Gang."

"Roxy and his Gang."

The projectors used in this theatre are all equipped with Rockbestos Motion Picture Cable—the life-line of the projector.

This cable is largely responsible for the smooth, continuous operation of the projector. The better theatres are using Rockbestos as part of their equipment.

Interior of Capitol Theatre, the most widely known Motion Picture Theatre in the world.

Send for samples of M. P. cable and arc, spotlight or fixture wire.

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B. H. SNOW, Northwest Editor

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The P. C. E. A. Membership Drive

A MATTER worthy of attention by men who expect to attend the N.E.L.A. convention, is this: a drive for additional membership in the Pacific Coast Electrical Association has just been inaugurated. The cost of a Class "B" membership, that is, the type of membership open to employees of member companies, is only $3 per year. The annual proceedings furnished free to members is worth more than that alone, to say nothing of the many other considerations and privileges of membership. While admission to the various functions and sessions at the Auditorium will not be confined to members exclusively, it should be pointed out that while Class "B" membership costs but $3 per year a registration fee of $5 will be charged to all nonmembers. It does not require a Scotch ancestry to determine the advantages of membership under the conditions cited above, nor should it require any further comment to emphasize the responsibility of every member of the electrical industry on the Pacific Coast, especially in California, their obligation as hosts, and the desirability of bringing about a record attendance at all convention meetings. A $3 membership in the Pacific Coast Electrical Association carries with it membership in the N.E.L.A. at no additional cost, and with all the rights and privileges involved in such membership. There should be at least 1,000 new members between now and the first of June.

EDITORIAL

Beautification of Properties as a Phase of Public Relations

AT a recent meeting of a committee of the Northwest Electric Light and Power Association to discuss public relations, the question of the beautification of grounds around stations and structures was brought up. All present agreed that properties should be kept clean, neat, painted, and beautified with grass, shrubs and flowers. Many examples of favorable reactions by the general public were cited by the committeemen in relating personal experiences. Of these probably the most spectacular was the case of a customer of the Pacific Power & Light Company who bought a block of stock largely because he felt that a company that kept its buildings and grounds well groomed must be a safe one in which to invest. The committee was unanimous in approval of the idea, which is not a new one among utility companies of the West, and agreed that here, where nature has been generous as to soil and climate, the problem is neither difficult nor expensive.

Closely allied to the specific subject of beautifying grounds is the question as to how far a power company should go in capital expenditure for purely decorative features of buildings. It is conceivable that in architectural embellishment one could go too far. Obviously a power house should not be modeled after the Parthenon in marble, even though it would be infinitely more beautiful than concrete, and perhaps outlast it. Power buildings should not look like Greek temples nor yet like subtreasuries of the United States, nor, in fact, like anything other than what they are; and, of course, since rates have a direct relation to investment, it is due the payers of the rates as well as to stockholders not to exceed the bounds of reason in embellishment.

First of all, the buildings should give an impression of permanence and solidity. Then, in accordance with their relation to their surroundings, they should be decorated to an extent that will create a favorable reaction in the minds of the people who see them. As a case in point, there is the new substation of the Puget Sound Power & Light Company to be erected in a residence district of Seattle. The architect's drawing shows that the building will have a proper appearance of solidity combined with suitable decoration, so that it will be an ornament to the district in which it is to stand. Inquiry discloses that the cost of this decoration will add less than 5 per cent to the total cost of the building, which would seem entirely within reason. It is probably true that each structure presents its own problem in this respect, since location has a direct bearing on the extent to which expenditure for ornamentation is warranted, but it would be interesting to know if anyone has thought enough about the general subject to have determined just what this percentage ought to be.

The Industry Should Preach the Doctrine of Electrical Safety

THE necessity of selling journeyman electricians and others in the industry the idea of the absolute safety of electricity for water heating and other heavy-duty applications in the home recently was brought to the attention of a member of the electrical fraternity in the San Francisco Bay district.

He had ordered an automatic electric water-heater installed by a responsible electrical contractor. Returning home after the installation had been made, he found that the journeyman who had done the work had told his wife to be very careful as the automatic feature was liable not to work and the tank might explode. He also implied that electric thermostats on water-heaters were not dependable.

These few remarks would have left the average housewife with a feeling of distrust about the safety of the device and would have destroyed a great deal of the pleasure to be obtained from its use. This would tend to retard the greater use of electricity in the home.

Electricity is the safest form of light, heat and power, and is so regarded by the National Board of Fire Underwriters. A correctly made device, properly installed, should be the essence of safety. All members of the industry must be brought to the realization of this fact if electricity is to be utilized to the fullest extent in the home.

The Contractor Is the Outlet of the Electrical Reservoir

THOSE of us who are not so old as to have forgotten our high school physics may remember that, regardless of the dimensions of the container, the size of the outlet regulates the quantity of flow therefrom, other conditions being equal. A reservoir containing 1,000,000 acre-feet of water will discharge no more water through a 1-in. pipe than a reservoir containing 1,000 acre-feet, if the head is the same.

The electrical industry is in very much the same situation, for, regardless of the great development of power plants, the concentrated energies and man-

ufacturing capacity of the great electrical industrial concerns and so on down to the established channels of distribution, the fact remains nevertheless that in many respects the electrical contractor is the neck of the bottle, the outlet from the great reservoir. If the contractor does an adequate job of house-wiring that provides for the maximum installation of appliances, the market for the manufacturer's goods and the market for the energy on sale by the central station is established. If, on the other hand, the contractor in his eagerness to get a job tries to cut and trim, leaves out this or makes something else smaller, he has helped to plug up the neck of the bottle through which the flow should be free and uninterrupted. Is it not, therefore, incumbent upon the rest of the industry to lend every possible support and assistance to the contractor in order that he may feel a real sense of his own responsibilities to the rest of the industry, and that the industry in turn may realize its responsibility to the contractor as well? The relationship is clear; the benefits of this relationship are mutual. The sword is two-edged; it cuts both ways. In fact, interdependability nowhere is emphasized more keenly than among the various branches of the electrical industry. Now that we have for the first time a nucleus in the state-wide organization of electrical contractors in California under the auspices of the Electragists International, it behooves all of the rest of the industry to help in every way possible in getting this new cooperative enterprise firmly and permanently established.

An Opportunity to Learn "What's the Matter with the Electric Truck?"

IN a letter to the editor of one of our contemporaries a reader asks the question, "What's the matter with the electric truck?" He answers his own question with the accusation that indifference and lack of vision on the part of many of the utility executives is largely responsible for the slow progress to date in this important phase of central-station development. In the main this criticism is a little harsh, but there are some sections of the country where it will apply.

There are instances where sales departments are working industriously to build battery-charging load through cooperation with truck and battery manufacturers without proper recognition on the part of company executives. There are other instances where no thought at all is given to this class of load. And there are some instances—fortunately few in number—where the electric truck is looked upon with actual disapproval.

So far as the West is concerned, liittle has been done in the development of the electric truck except in California and Colorado. This has been largely due to lack of information rather than indifference. This situation promises to change as the result of a decision to hold an electric transportation school in San Francisco the week prior to the National Electric Light Association convention in June.

Arrangements have been made with Eastern truck and battery manufacturers and those contral stations which have had a wide experience in the development of electric truck business to send a corps of capable instructors to conduct the classes.

The school has been arranged for and sponsored by the transportation bureau of the Pacific Coast Electrical Association. This has been done in addition to the preparation of an excellent report on the progress and possibilities of developing a battery-charging load in California.

It behooves central-station executives in every section of the West to delegate men in their commercial department to attend the school and participate in the classwork. They are bound to bring home a new feeling of the importance and desirability of this load. And in this connection we might recommend that the executives themselves would be well repaid if they would spare sufficient time to attend the school.

Wood Poles Store Bird's Winter Supply of Food

WOODPECKERS, acorns and transmission line poles form a bad combination. On another page in this issue appears an item describing the damaging results of the persistent and successful efforts of this species of bird in using a wood pole for the storage of his winter food supply. On the face of it this is an amusing incident. However, it is proving to be expensive amusement, and as far as has been discovered to date there seems to be no effective way successfully to combat this nuisance.

Of course, the first thought to come to mind is the suggestion that the use of steel poles would obviate the difficulty. However, there are economic considerations which do not permit the expenditure necessary for steel poles, in the minds of the powers that be in this particular case. We are wondering whether or not some of the members of the electric-service fraternity will have something feasible to suggest other than the extermination of the bird.

Adequate Wiring Standards and the Red Seal Plan

INTEREST in the so-called Red Seal Plan is growing, the more familiar men of the industry become with its possibilities. In brief it affords a means of establishing adequate wiring standards for the home. What is meant by adequate? The answer to this question is that what may be regarded as adequate in Iowa would be ridiculously inadequate in California by reason of the greater development of electricity in that state. Adequate in a Californian sense means a system of wiring beginning with the meter that provides ways and means for the ultimate installation and use of every household electrical appliance. If the industry can be made to see the importance of this, a great element of sales resistance toward the increased use of household appliances will be removed. When a housewife discovers that in order to install a range she has not

merely to purchase the range itself but also to provide a considerable sum of money in addition for alterations in the wiring, it is difficult indeed to consummate the sale. It is gratifying to note the strong tendency throughout the industry toward the establishment of higher standards providing for better service to the user of electricity. Such moves are thoroughly constructive and should be supported in no half-hearted manner.

DISCUSSION

"Some Cat and Some Telephone Pole!" Comments a Telephone Company Reader

To the Editor:

Sir—I was much interested in the communication on page 197 of the March 15 issue of the Journal of Electricity entitled "Electro-Thermo Zoologist Required to Answer Questions Raised by Engineer," and particularly in the third line of the second paragraph of the newspaper item which formed a part of the story.

They must run hog-wild on joint construction back there in Knoxville! In this country it would have to be **some cat** that could stand on a telephone pole and carelessly move its tail so as to come in contact with 44,000 volts!

I would like to have added one more question to Mr. Letson Balliet's list and ask why it is every newspaperman refers to every pole as a "telephone pole?"

Lindsley W. Ross,
The Pacific Telephone and
Telegraph Company.

Portland, Ore.
May 1, 1925.

Lawyers or Engineers—Both Hold Executive Positions

To the Editor:

Sir: I have read your April 1 edition of the Journal of Electricity, especially your second editorial on page 233, entitled, "Specialization and the Executives of the Future."

Please advise me regarding the following:

1. How many lawyers are paid subscribers to the Journal of Electricity?
2. How many engineers?
3. How many legal firms or corporations advertise in the Journal of Electricity?
4. How many engineering firms?

Warren H. McBryde,
Secretary California and Hawaiian
Sugar Refining Corporation

San Francisco, Calif.
April 6, 1925.

It's Not the Education but the Man That Makes a Good Executive

To the Editor:

Sir—Your editorial in the April 1 issue, entitled "Specialization and the Executive of the Future," contains some misleading statments; statements which may be true but from which wrong conclusions are apt to be drawn.

When you advise all college men to study law that they may become executives, aren't you assuming that all men are fitted for and enjoy executive work? Aren't you also assuming that this executive ability can be educated into any college man? I note Mr. Masson's letter in the May 1 issue and I will give you another incident in connection with Eugene Grace that may illustrate my idea that some lawyers are executives not merely because they are lawyers but because they have executive ability. I recently met a man who was a classmate of Eugene Grace's. Both started to work for the Bethlehem Steel Corporation at the same time and in the same department. My acquaintance is a good engineer of a certain type but if you know him you realize why he isn't in Eugene Grace's place. He had the same education and start but —.

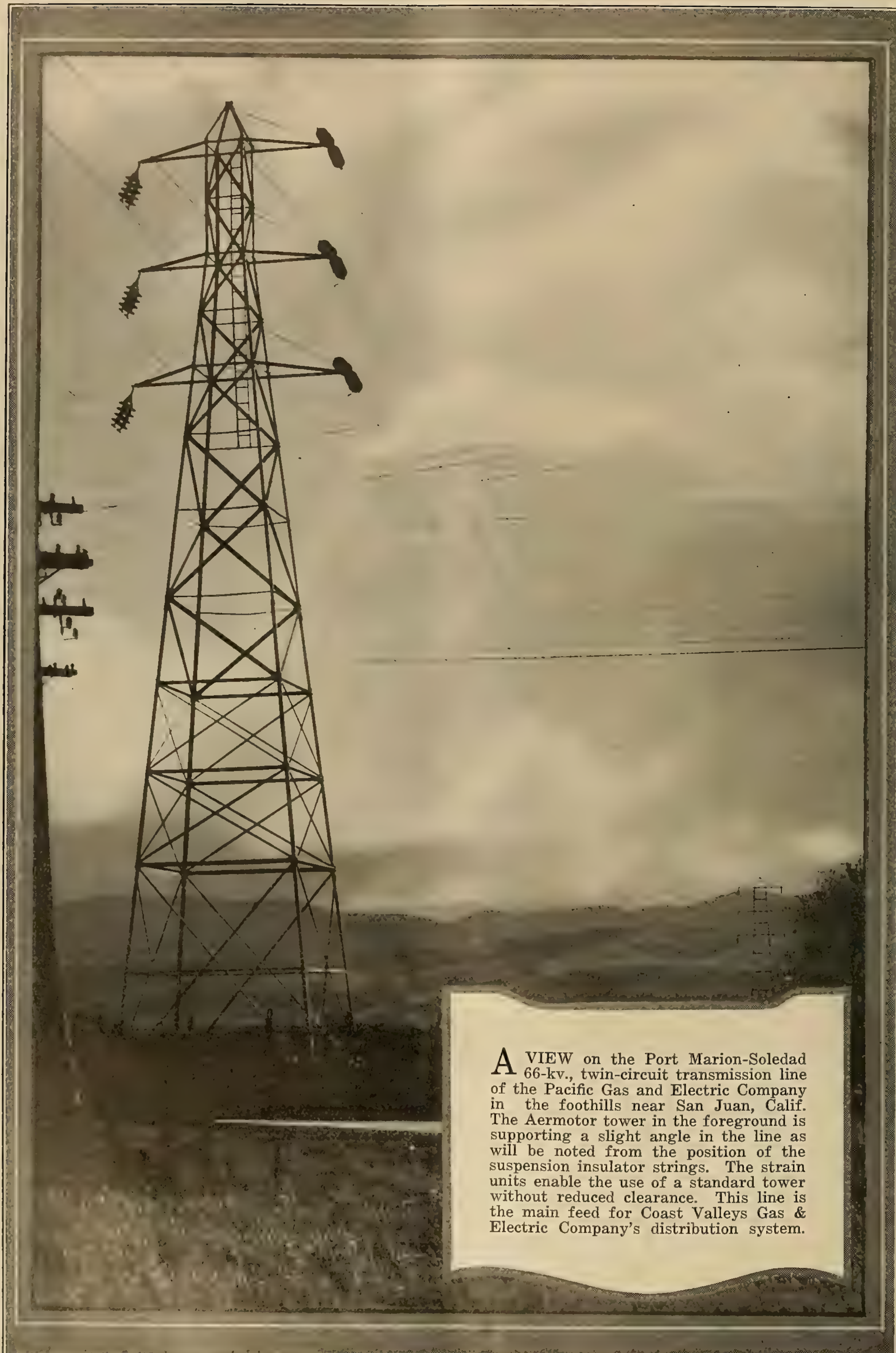
It has been suggested that engineering courses be divided along functional lines, research, design, supervision and management rather than along the lines of civil, electrical, etc. If this was done the engineer of executive ability might have that ability developed more than at present. Now it is unusual for a student who has executive ability and is interested primarily in men to choose engineering, he is more apt to study law. For this reason you do find a great number of lawyers in executive positions.

To any engineer who is dissatisfied with his profession I would say "Go out and tell your tale of woe to every lawyer and doctor and business man you can find. If you believe all you are told you will be sure, when you come back, that engineering is the only profession in the world with all advantages and no troubles." I believe that 90 per cent of the people think that their lack of progress is due to circumstances outside themselves. They think that were they only in some other profession, or location, or time or circumstance they would be world beaters. I believe most men are what they are mainly due to their own ability and energy and that the opportunities of life are pretty well distributed.

Furthermore your editorial gives the impression that the higher offices of industry are closed to engineers. I haven't any data on industry in general but I note that Julius Kruttschnitt states, in the May "Mechanical Engineering," that 34 per cent of the chairmen and 19 per cent of the presidents of the railroads of the United States are engineers. Our case is not so hopeless after all; the engineer who can not only design, build and operate things but who can also manage men and money will find plenty of opportunity to use that ability.

George L. Sullivan,
Dean, College of Engineering,
University of Santa Clara.

Santa Clara, Calif.,
May 6, 1925.



A VIEW on the Port Marion-Soledad 66-kv., twin-circuit transmission line of the Pacific Gas and Electric Company in the foothills near San Juan, Calif. The Aermotor tower in the foreground is supporting a slight angle in the line as will be noted from the position of the suspension insulator strings. The strain units enable the use of a standard tower without reduced clearance. This line is the main feed for Coast Valleys Gas & Electric Company's distribution system.

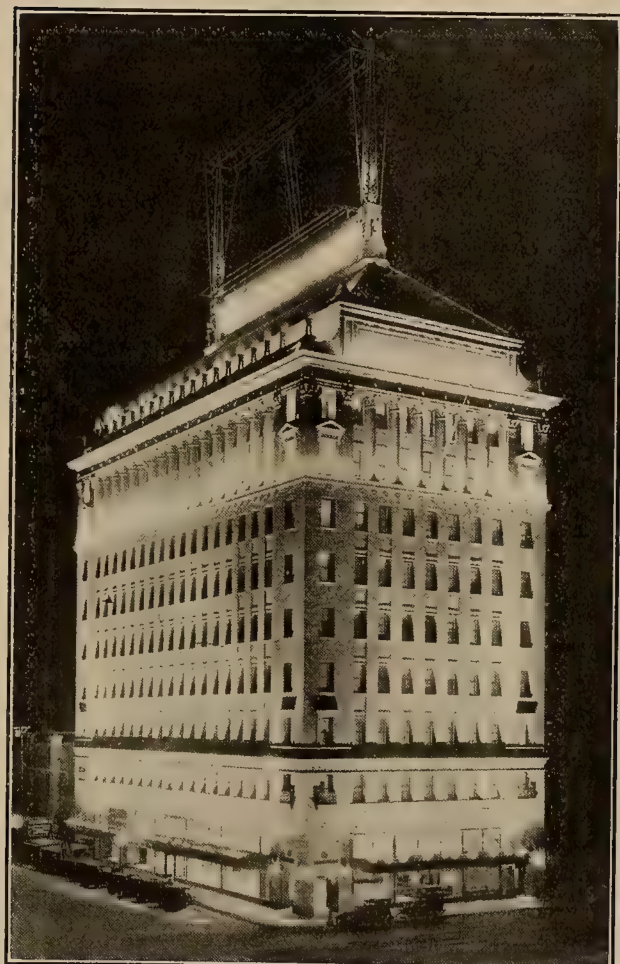
Commercial Possibilities of Color Flood-Lighting

By A. M. Frost

Power Sales Manager, San Joaquin Light & Power Corporation, Fresno, Calif.

DEEP-ROOTED in mankind is a love of light. It is an instinct as basic as life itself. It is an instinct found in the lowest organisms and on up to the highest. The primitive fisherman used a torch to bring his salmon to the surface when he might thrust his pronged spear into its body; the moth leaves its feeding ground to flutter about the light; the whole town turns out to witness a fire. Through all the ages light has been the most potent of all forces to attract mankind. The advertising value of light is fundamental—no argument is necessary to establish it.

But it is a tendency of the civilized man soon to tire of those things he sees frequently. Something new must be presented or he loses interest. Even light loses it glamor unless new schemes and effects are evolved. The flood lighting of buildings is not new. White lights have been used to draw attention to the architectural beauty of buildings for many years. While such lighting adds to the civic beauty of a city and serves to impress strangers, it soon loses much of its novelty for the permanent resident. He knows it is there but pays little attention to it.



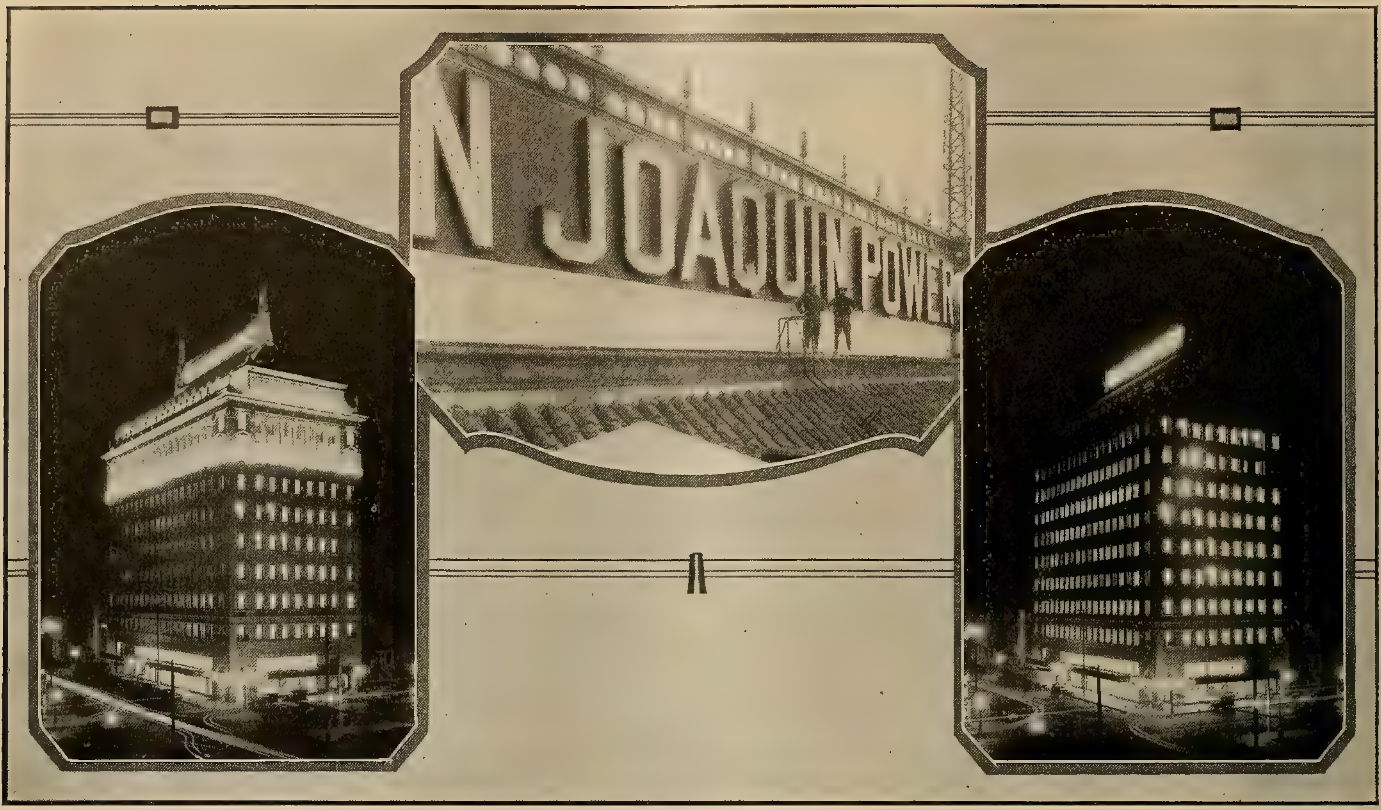
Color flood-lighting is one of the newest developments in the illumination field. One of the finest examples of this new art is the San Joaquin Power Building at Fresno, Calif. In this article the author describes the installation and points out some of the desirabilities of color flood-lighting from the standpoint of building owner, contractor and power company.

With this thought in mind the architects and illuminating engineers studied the problem of flood-lighting the new million-dollar home of the San Joaquin Light & Power Corporation at Fresno, Calif., to design a system of such beauty and variation as to impress all who may view it, not only the first night it is shown but on successive showings. The advertising value of such an installation was given due consideration, first because the building was a model of electrical convenience, embracing faultless interior lighting and every conceivable electrical device from the fractional horsepower electrical towel in all the lavatories to the high-powered motor equipment of the latest model gearless elevator, vacuum blowers, and the 150-ton ammonia compressors of a ventilating system which maintains a uniform temperature of 72 deg. the year around. And like a label on a fine package, it was decided to install a flood-lighting system in keeping with the model interior equipment; and, second, to develop a feeling of good will in the community by a contribution to the civic beauty of the city.

Casting about for an inspiration, the marvelous color effects designed by D'Arcy Ryan for the Panama Pacific Exposition were singled out as a guide. To reproduce on a commercial office building the colored lighting effects obtained on the exposition buildings was the aim of H. H. Courtright of the Valley Electrical Supply Company and his illuminating engineer, Carl F. Wolff, but with one important deviation from the methods employed by Ryan. The scheme must be self-contained as a part of the building, for no chance could be taken to use adjacent roofs or poles to support the flood-lighting equipment. This is always a gamble in a fast growing city such as Fresno.

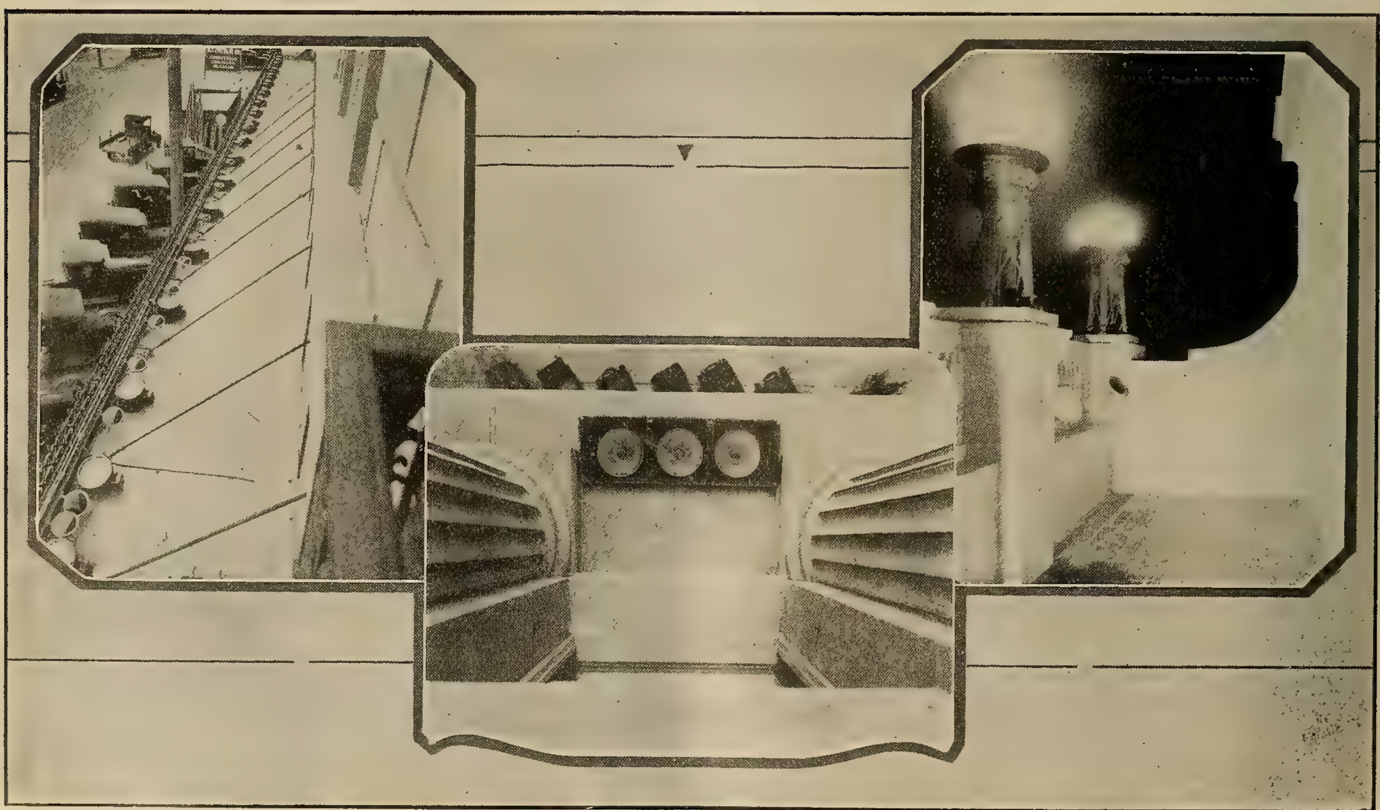
The architecture of the building at once divided the exterior into three distinct components which required their own illumination, as they have distinct architectural detail; yet the ilumination at the same time must tie together these components so as not to destroy the architectural balance.

Properly speaking, there are four parts to the exterior elevation, but, as the first or lowermost part receives its illumination from the interior lighting



The effect of flood-lighting the building with the colonnade and promenade lights only is shown at the left. In the center is a close-up of the sign on the roof. How the building would look with no flood lighting can be determined from the view at the right.

source through the immense glass windows and their transoms, we will give here only details of the three upper components of the flood-lighting equipment. It is sufficient to say that the lobby covering practically the whole of the first floor is illuminated from an indirect source which is capable



Details of flood-lighting equipment on San Joaquin Power Building. At the left are the lights on the marquis. The large units are General Electric type L-15 with 1,000-watt lamps. The small units, used for color lighting, are 250-watt X-Ray No. 51 projectors. The flood lights at the base of the colonnade, shown in the center, are 250-watt No. 810 projectors. The adjustable flood lights on the promenade are 250-watt X-Ray No. 51 projectors. The same type are set in the urns above the steam jets. The lights at the four corners of the building are 500-watt X-Ray No. 60 projectors.

of three intensity controls. In addition to this intense, yet soft, illumination, there are installed varied colored window projectors, two to each window, which permit the display on the lobby floor immediately in front of these windows to be set in sharp contrast to the general atmosphere of the lobby.

The effects are obtained by three banks of concealed flood-lights, the first consisting of 84 projectors mounted on the roof of the marquis above the first floor. Another row of 112 projectors, lighting the colonnade, is buried in the terra cotta on the cornice projection on the eighth-floor line, while a third bank of 21 projectors on the tenth-floor line lights the promenade. Spot lights on the lower corners of the roof gables bring out the roof lines and accentuate the radio towers. Lamps at the base of the towers produce a silhouette effect of the steel framework. No bare lamps are used except those in the sign.

The eight-foot electric sign heralding "San Joaquin Power" extends 60 ft. along the crown of the roof. It is equipped with a flasher by means of which the entire sign may be flashed on and off or the name spelled out letter by letter.

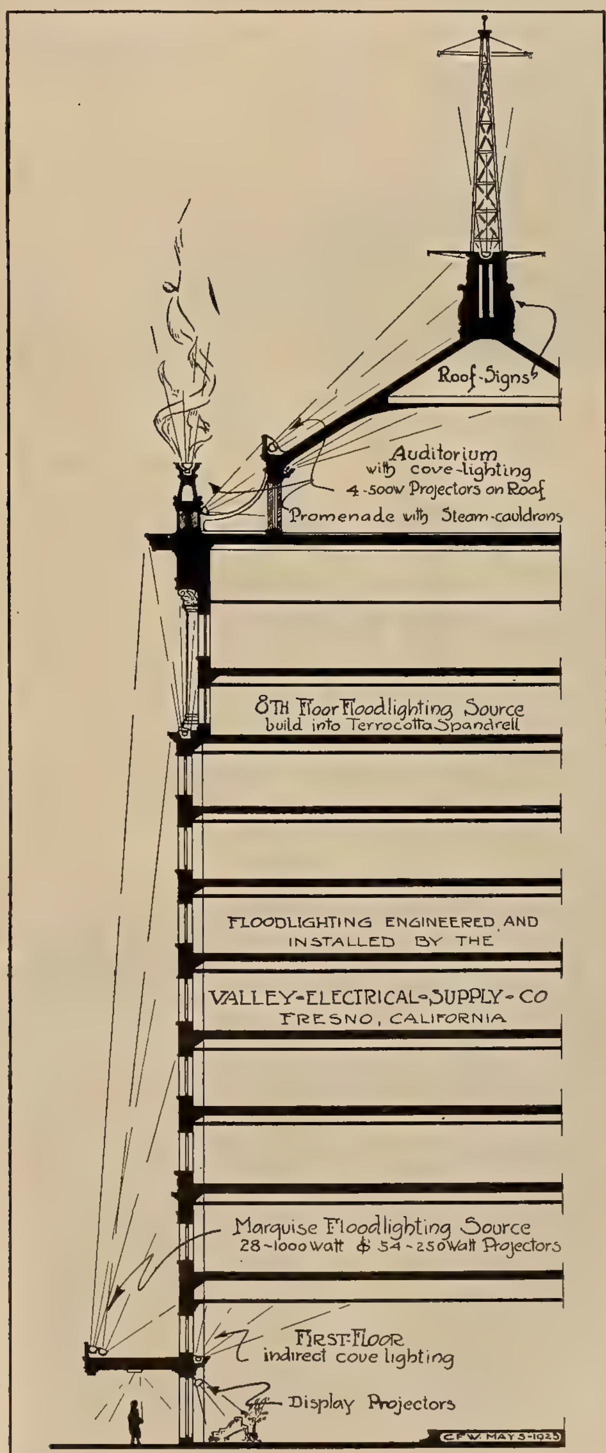
The result is an achievement in illumination. Imagine a cream-tinted terra cotta and pressed brick facade, 90 ft. high, all bathed in a soft magenta or ruby light seeming to come from nowhere yet painting every brick and ornate projection with varying tints and shades of this dominant warm color. Then picture a mauve or purple band, with flecks of emerald green, reflected from a Corinthian colonnade extending another 30 ft. above the base of ruby tints. And above, a narrow band of emerald broken by a row of 21 flaming urns, the flame-colored light constantly in motion. Only a Maxfield Parrish could paint such a picture; only in the wonderful childhood dreams of fairyland could such a scene be brought before the mind. Yet this picture is painted nightly for the pleasure of Fresno, its residents and visitors.

While 48 such color schemes have been worked out, the possibilities of the installation are such that the number of displays may reach several hundred before it can be said that all have been shown. And therein lies the most notable feature of the San Joaquin Power Building flood-light scheme. The constant changing of the color effects draws residents to within a block or so of the building as each new combination is played. No visit down town during the evening is complete until the family has seen the new dress San Joaquin Power is wearing tonight. Ministers have commended the beauty of the building from the pulpit; the luncheon speaker in praising the city never fails to mention the San Joaquin Power Building. It has become a source of pride to the city to have "the most beautifully illuminated building in the world."

What does it cost? Considering the advertising value and good will developed not only for the power company but to the City of Fresno as well the cost is astonishingly small. The 48 effects that have been worked out vary from $3.76 for three hours to $9.36 for the same period. This includes steam used in the urns in the most elaborate scheme, while the standard commercial rate is used for computing the current consumed.

The flood-lighting load is not heavy, the total for the San Joaquin Power Building being 56 kw. Although it may come on during the peak period, it is a high-revenue load and as such is desirable to the power company.

San Joaquin Power has struck a new note in the use of electric lights for commercial flood-lighting. It has commanded the admiration of building owners throughout the West, while requests for details have come from all parts of the world.



Cross section of the San Joaquin Power Building showing the number and location of flood lights.

Annealing Glass with the Electric Lehr

By Kenneth M. Henry
Chief Chemist, Illinois Pacific Glass Company, San Francisco

ONE of the latest applications of electric heat is in the annealing of glass. After five years of experimentation the Illinois Pacific Glass Company has developed equipment which has many advantages over the older types of oil-fired lehrs. Chief among the advantages for which electricity is solely responsible is the close control of temperature within very narrow limits and a better quality of output. From the standpoint of the central station this new type of load is extremely desirable because it has a 24-hour demand.

CLOSE control of temperature within very narrow limits through the annealing cycle of the glassware, together with a better quality of output, are the outstanding results of the application of electric heat to glass lehrs by the Illinois Pacific Glass Company at San Francisco.

Early in 1920 we became dissatisfied with the best results obtainable in annealing glass, and our technical staff undertook the complete investigation of existing methods in order to find means for improvement. Inquiry disclosed that local annealing conditions were no worse than, and not very different from, those of most plants throughout the industry. Annealing furnaces, or lehrs, were of all sorts of designs, but as the underlying principle employed in all was the same, it was evident that the faulty results were due to that principle rather than to the apparatus used to apply it.

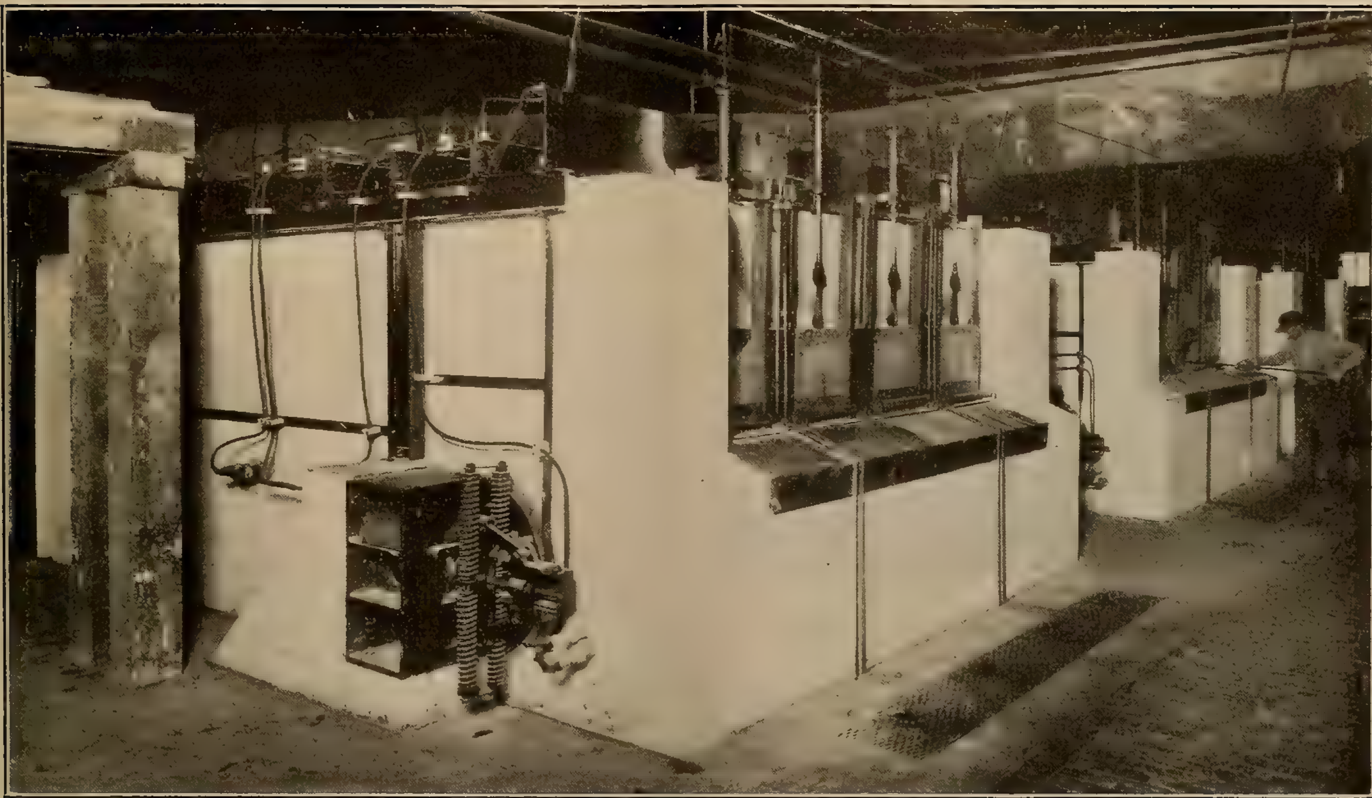
Next it was noted with interest that the development of annealing practice had been the development of the lehr and no serious thought had been given apparently to evolve a theory of the process and thus to improve and perfect the process itself. Manufacturers of glassware had inherited the idea that their ware had to be placed in an oven for annealing, or "tempering," and when the demands of increased production had to be met, they placed moving floors in their ovens to accommodate the output of automatic blowing machines. This increased capacity was accomplished with varying degrees of adroitness, but there was no evidence of any attempt to find out the exact treatment the glass required and to secure the application of that treatment.

Accordingly it was decided to attack the problem in the laboratory, and because glass bottles were the subjects in hand, to find out what a bottle required in order to be annealed properly. Without theoretical digression, it should be explained here that a bottle with its mutiplicity of curves and angles, and its variety of thicknesses, presents a much more difficult problem than the slab or sheet of glass. Nevertheless, after successive months of continuous work, it was learned that all of the supposed vagaries of glassware were obedient to fixed laws and an entirely new method of annealing was evolved. This process, now covered by basic patents, has placed annealing on a truly scientific basis, and has eliminated the "hit-and-miss" operations of former methods.

The success of the new process is due to the close control of the temperature which is affected. As soon as it was discovered how glass becomes uniformly annealed, it was evident that it would never be feasible to secure results by merely applying heat, however carefully measured and controlled, at one point in the annealing course and then leaving to chance and varying conditions the further oscillations of the temperature back to ordinary level. The laboratory work proved conclusively that true annealing only results from following a time-temperature curve that has been determined scientifically. The next step—to determine how wide a divergence might be made from this curve without harmful results—disclosed that the glass would not tolerate a departure of more than 5 deg. F. To maintain such a curve in laboratory apparatus is not difficult, but to reproduce the same conditions on a commercial scale and in a reliable and constant manner is quite another matter. In other words, the laboratory furnished the correct annealing principle, but it still remained to secure a lehr that would apply this principle to practice.

In working out the practical problem, it was self-evident that no sustained curve could be secured in any apparatus that only generated heat at one fixed place. It was equally apparent that the heat supply would have to be cut off and renewed at frequent intervals in order to maintain it at constant levels everywhere. The answer therefore was that there must be automatic control operated by the temperatures themselves, and this narrowed the choice down to electricity as the source of heat energy.

At first the high cost of electricity as a heating agency made its use seem prohibitive. Nevertheless it was decided to design and build an experimental electric lehr, and in cooperation with the engineers of the General Electric Company this was accomplished in 1921. Like all wise experiments this was



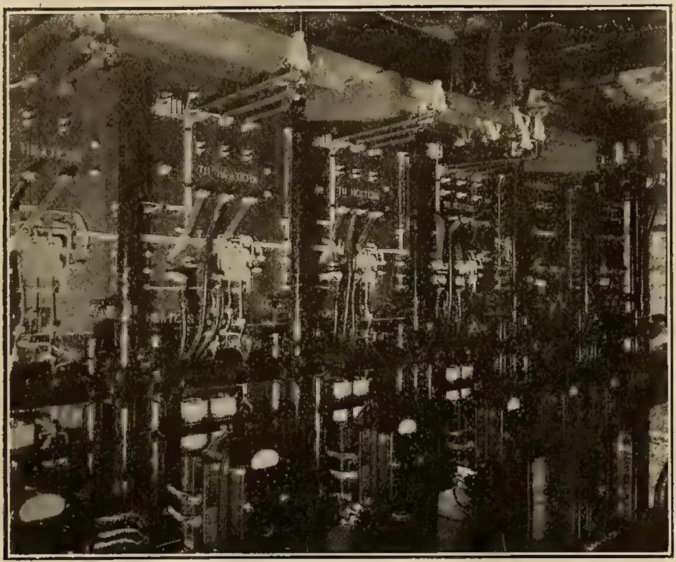
The front of a battery of three electric lehrs showing the compressed air operated doors through which a workman passes the hot bottles. On the side of the first lehr may be seen some of the wires leading to the heating elements.

a modest one although large enough to give commercial results. This first lehr has a continously moving conveyor 5 ft. wide and 50 ft. long; this was furnished by Stephens-Adamson Company. The nichrome heating units have a connected load of 160 kw. The power is supplied at 220 volts, single phase, 60 cycles. The lehr is divided, by imaginary lines, into three parts—heating, annealing, and cooling. The electric units are so distributed on the sides and top of the lehr in these three departments that they maintain constantly and unvaryingly the temperature curve mapped out in the laboratory. The conveyor, returning from the cold end of the lehr, is preheated on the return by a special set of heating elements. The lehr is insulated adequately with carfully laid Sil-o-cel brick. The heat control is maintained automatically within 5 deg. by Leads & Northrup controlling potentiometers that make and break the corresponding contacts on the switchboard.

As far as annealing was concerned the first lehr was a complete success from the very outset. The automatic regulators functioned as planned and kept the temperatures well within the limits laid down. Nothing was left to be desired in the maintenance of the curve on which the annealing depended. The consumption of electric power, while not prohibitive, was in excess of the limit desired for the economic success of the new process. But this has yielded to new studies, and without any alteration of the process or of its established time-temperature curves, the electric lehr now has been placed on an even keel with others in the matter of economy of operation.

Thus the experimental lehr was a true success and by means of the knowledge gained from it a larger lehr was designed. This second lehr is 8 ft. in width and 55 ft. long with a heating space 25 ft. in length; subsequent lehrs are 9 ft. by 60 ft., which has been found to be a more satisfactory size. The conveyor belt is made up of special patented pans which cut off all stray currents of air. Its automatic doors confine the heat at all times that glassware is not actually passing into it. The doors open by compressed air and operate with a foot-control button; as soon as the operator removes his foot they close automatically. The total connected load in each lehr is 300 kw. with a usual operating load of 80 kw. The lehrs are in continuous operation 24 hr. every day in the year. Current is supplied at

The front of the control board for the electric lehrs. Heat control is automatic within 5 deg. through the use of Leads & Northrop controlling potentiometers.



The rear of the control board showing the heavy bus construction and the individual meters on each lehr.

220 volts, 3 phase, 60 cycles. The load varies with the amount of glass in the lehr. The current maintains the proper temperature cycle and supplies the radiation losses. All of the apparatus is completely automatic in its operation. Individual meters have been placed on each heating unit so that it is possible to tell if everything has been working satisfactorily over a given period; and if not, to estimate how long the particular unit has been out of operation. One of the advantages of electric heating is the fact that bottles come from the lehr sterilized.

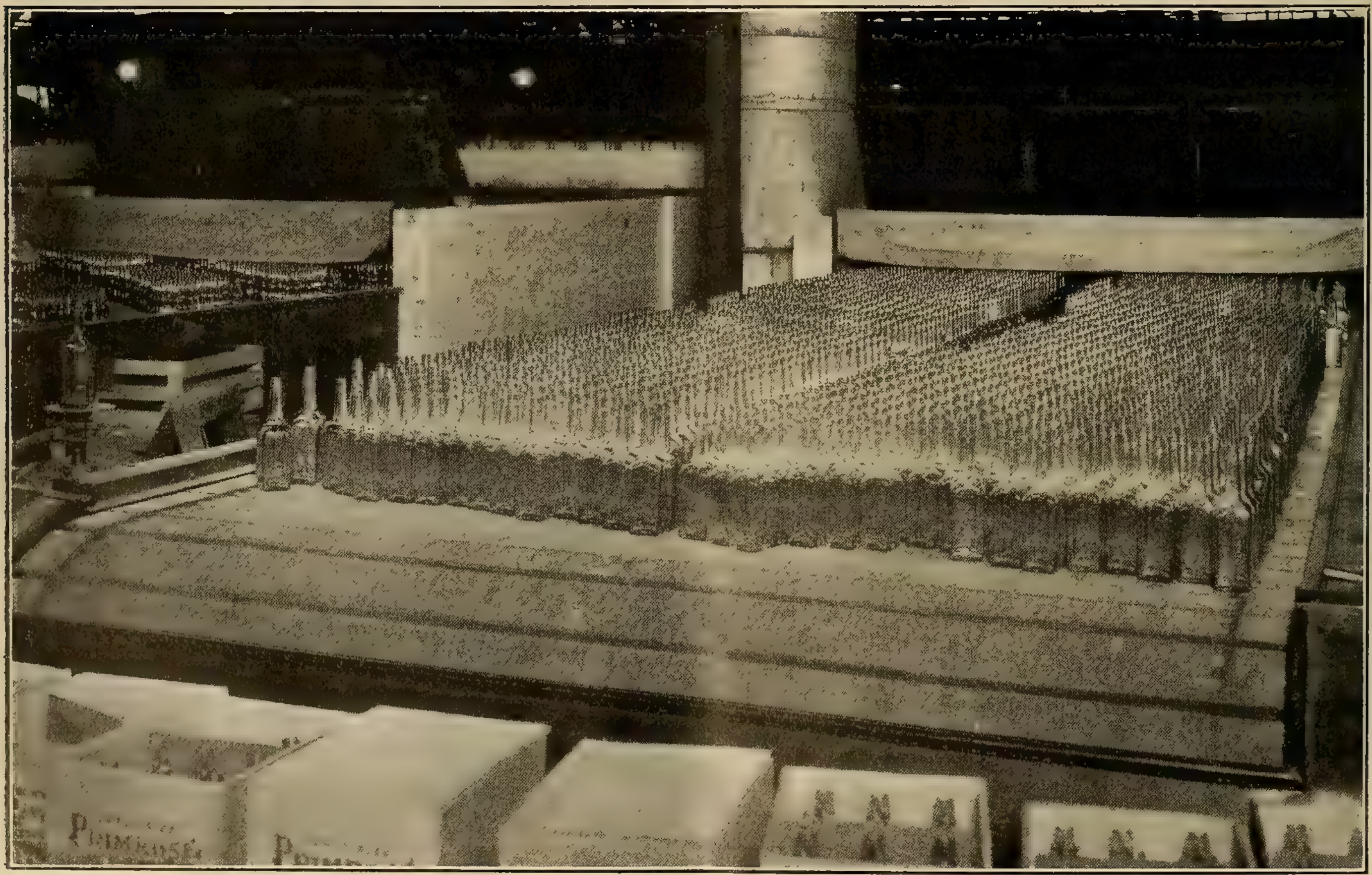
Previously it was necessary to leave bottles in a lehr from 4 to 10 hr. while with the electric lehrs this time has been reduced to one hour and thirty-five minutes. The first lehr now has five successors, each of which is doing its work, comfortably, perfectly and as cheaply as the old lehrs which it has displaced. The demand for the very superior ware from these lehrs has been so insistent that it has been embarrassing to complete the change of lehrs as leisurely as we had planned. In fact, we have been compelled to put the electric lehrs into place and into operation as rapidly as the shut-down of glass furnaces would permit, and in a short time this factory will be annealling its entire output in the new way.

Three lehrs are grouped together in a bank which is complete in itself, each bank having its own transformers. At present one bank is complete and two more are in the course of construction.

Incidentally it may be added that the maintenance of the new lehrs is so low in cost as to be negligible. The first experimental lehr has cost for upkeep during the three and one-half years of its operation a total of $25 and is today in as good condition as when installed. The other lehrs have cost nothing over an operating period varying from two years to a month.

Two equipments recently have been purchased by the company for use in its Alton, Ill., plant which will have a connected load of 470 kw. each.

The writer is indebted to P. D. Burtt, superintendent and engineer, and George W. Fiske, chief electrician of the Illinois Pacific Glass Company, for their cooperation in the erection of the lehrs.



The back of one of the electric lehrs showing annealed bottles emerging ready for packing. The electrically driven conveyor travels at a speed of 6 in. a minute. In other types of lehrs it was necessary to wash all bottles after annealing.

Utilization of Electricity in the Salt Creek Oil Fields

By Chauncey H. Vivian
Boulder, Colo.

A 25,000-kw. generating plant recently has been put in commission by the Midwest Refining Company in its operations in the Salt Creek oil field near Casper, Wyo. The transition from steam and gasoline power is now under way at the individual wells, and within the next few months the operations will be electrified completely.

The plant is unique in several respects. Chief among these is its use of natural gas for fuel. This is derived as a waste product from the gasoline-extraction plant. The gas is produced from the company's own wells. Because of the recovery of its gasoline content and the further fact that the government requires no payment of royalty upon it, a remarkably cheap fuel is obtained.

Another unusual feature is the use of artesian water for both condensation and boiler purposes. This is secured from a well which was drilled at Tisdale a few miles away in prospecting for oil in 1917. This water is delivered through a pipe line laid and operated by a private company.

The plant is situated at the north end of the field, approximately 30 miles north of Casper. It is housed in a fireproof structural steel and concrete building 150 ft. long, 117 ft. wide and averaging 50 ft. in height. Four 96-in. steel stacks rise 60 ft. above the roof. Adequate lighting facilities are provided, the installation of window panes being 5,400.

Four steel-encased, 1,300-hp. boilers of water-tube type comprise the steam plant. They are designed to deliver from 200 to 300 per cent rating. Each is 17 by 18 ft. in area and 41 ft. high. They operate at 275 lb. pressure. Induced-draft fans are installed in the stacks to draw off the waste gases.

The flame is applied in the boilers through cross-type burners consisting of 110 to each boiler. To care for emergency needs there also has been installed a fuel oil burner system in the boilers. From the boilers the steam passes through superheaters and is delivered to the turbines through 18-in. pipes.

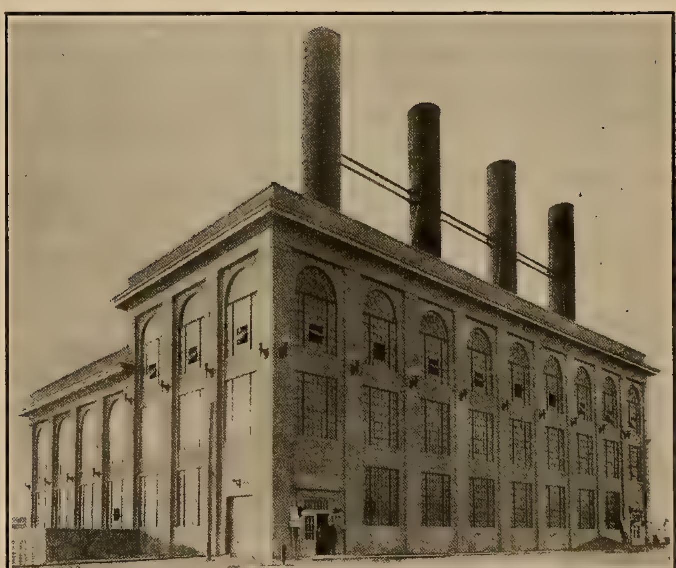
Two units of 12,500 kw. each have been installed in the generating room. To each is connected a 16,000-sq. ft. condenser. Air for cooling the generators is drawn from outside through a tunnel and is filtered to remove dust. A 500-kw. house turbine is present as emergency equipment to drive the auxiliaries in case of outages.

Two steam circulating pumps of 18,000 gal. per min. capacity furnish the circulating water to the condensers. They are driven by 400-hp. motors. Two boiler feed pumps of 400 gal. per min. capacity operate at 350-lb. pressure. One is driven by a 450-hp. motor and the second by a 150-hp. steam turbine. Three house service pumps, driven by 50-hp. motors are installed to furnish water to all parts of the building. Each has a capacity of 500 gal. per min.

Two evaporating systems for supplying distilled boiler feed water are present. The water also passes through a deaerator to remove gases which might affect piping. Each electrical unit functions separately, control being provided through a central switchboard. A 40-ton traveling crane is provided overhead and a 10-ton auxiliary hoist is provided for handling small loads.

Power leaves the plant through four 33,000-volt lines extending to six main substations, of which three are located on each side of Salt Creek field. There it is stepped down to 4,000 volts, while it is reduced to 440 volts at substations provided for the individual leases where the power is used.

Originally it was planned to impound flood waters of Salt Creek to provide condensation water, there



Exterior of the new 25,000-kw. steam plant of the Midwest Refining Company in the Salt Creek oil fields of Wyoming. Energy is used exclusively for the operation of the oil fields belonging to the company.

being no stream of regular flow in the region and no lake of sufficient size to answer the demands. To create a reservoir, a dam 960 ft. long, 47 ft. high and 12 ft. wide at the top was constructed. It has a concrete core and contains 2,000 ft. of drain tile. A tunnel 7 ft. high, 6 ft. wide and 400 ft. long extends through the dam, fitted with high pressure gates to regulate the flow of water. Water going through the condensers is screened by stationary and traveling screens.

This reservoir was planned for an area of 22 acres and a capacity of 21,000,000 bbls. Flood waters with

which it initially was filled brought down considerable silt and debris which reduced the impounding capacity to some extent.

The transmission line utilizes 6,000 cedar posts. Two of the 33,000-volt lines form a loop about the field, following section lines. A third extends southward to Teapot Dome adjoining the Salt Creek field.

The electrification of Salt Creek field comprises one of the largest industrial generation projects in the country. Investigation looking toward the change was started in 1921. A report was compiled by F. O. Prior of the company's engineering staff, working under the direction of A. W. Peake, chief engineer, who had charge of the construction.

After years of operation of the wells the gas pressure which at first forced the oil to the top of the ground in the form of gushers was reduced to such point that many of the older wells had to be placed on pump. Individual pumping units were installed at each well, being powered by gasoline or steam engines. A number of these were replaced with motors driven by power generated at the gasoline-extraction plant and careful costs kept over a period of months. These observations convinced the company of the utility of electrifying the entire field, and plans for the construction of the plant were then formulated.

In addition to the pumping operations, new wells also will be drilled by electric power, and the saving in this work will be great.

Up to the present time practically all of the production of the field has come from the first and second Wall Creek sands, which blanket an area of approximately 20,000 acres. Approximately 1,250 wells have been drilled to the first sand and all but 130 of them extend to the second sand.

Figuring 20 wells to the quarter section to raise the oil content, it will require 2,500 wells to "drill up" the field. Some operators contend, however, that as future years bring a greater scarcity of oil and a higher price, it will be economically profitable to drill as many as 36 wells to the quarter-section, which would bring the total wells to approximately 4,500.

Recent deep drilling operations have revealed the presence of oil in deeper sands, and it is probable that before the field is abandoned practically all of the existing and future wells will be extended to lower strata. All of these then will reach the stage where they will have to be placed on pump to insure yield. It may readily be seen that the load on the plant will increase constantly and that it ultimately will reach a point where the present generating power will be insufficient. Foreseeing such a condition, the plant has been constructed with a view to economically adding one or more units.

The vast amount of electrical equipment that will be required as development of the field progresses can be gleaned from the statement that each well will require an individual motor with connections. These motors for pumping purposes vary from 5 to 75 hp.

The plant was placed in operation early in January, 1925, and connections with the various wells have been made as fast as possible since that time. On Jan. 15 there were 215 wells in the field that had ceased flowing. It is estimated, however, that when all are placed on pump they will yield from 10,000 to 15,000 bbl. of oil a day, which will gradually decline over a period of years.

No doubt many readers are wondering in their own minds why such a heavy investment was made in a steam-electric central station which in turn calls for an additional expenditure in electrical equipment for well installations, substations and transmission lines. This question can be answered by stating that the application of electricity for pumping and drilling purposes in oil fields has proved a decided success in the California and Mid-Continent fields. Statistics from several different oil companies operating in these territories prove beyond a doubt that electric power applied with good judgment has proved more economical than either gas or steam engines.

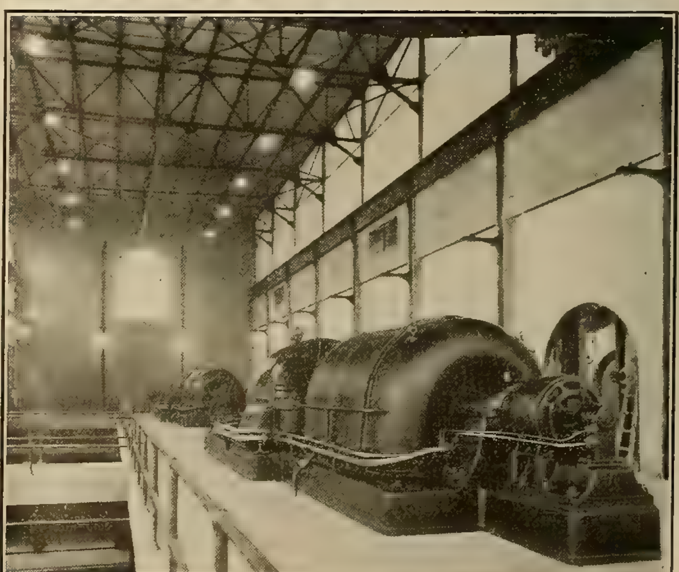
Preliminary investigations of engineers indicated that the cost of electrical installations at the wells would average 20 per cent less than any other power system, while the operating cost was computed to be 40 per cent less. A great amount is saved in labor, engineers and firemen being dispensed with at pumping wells under electrification.

From a safety standpoint it also was estimated that the electrification would pay. Electric lighting of rigs is expected to reduce the number of accidents in night drilling, while the danger of explosions in gassy areas also has been lessened greatly.

Salt Creek is the only field in the Rocky Mountain region operating wholly by electricity, although installations in other fields of the country have shown that the method is entirely satisfactory in every way.

The power will be used by the Midwest company exclusively. This use will extend to its operations of a number of leases held by subsidiary or allied companies.

The cost of the plant and transmission line was approximately $2,500,000. C. S. Saunders was superintendent in charge of construction, and W. R. Finney is in charge of the operation of the plant.



Interior of the turbine room in the new steam plant of the Midwest Refining Company showing the two 12,500-kw. units.

Is the Electric Air-Heating Load Desirable?

By George W. Barker
Allied Industries, Inc., San Francisco

ELECTRIC heating of homes and offices has been a controversial subject for many years. Many reports and studies have been made both on its desirability and its disadvantages. However, there are certain sections of the country, especially in the far West and in the South, where electric air heating is feasible and at the same time attractive from a central-station standpoint. In this article the author discusses some of the most debated phases of the subject.

ELECTRIC air heating for a long time has been a bone of contention among central-station executives. Those who, for various reasons, favored an increase in this class of business argued strenuously in its behalf. Others, opposed to the heating load, perhaps for reasons of expediency, have labored just as assiduously although possibly not as openly to forestall its increase. In either case it has been woefully true, as a general proposition, that argument has been based on nothing more substantial than individual conviction. The real merits of the case have not been investigated with sufficient care, and fact has been supplanted by fancy.

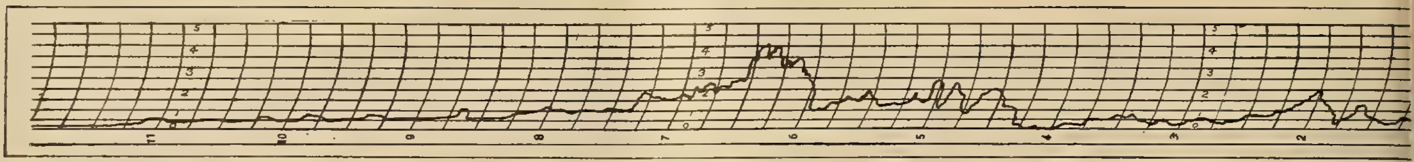
It is probably indisputable that electric heating of homes and offices has reached a higher state of development on the Pacific Coast than anywhere else in the United States, or, perhaps, in the world. It is certain that electric heating is applied more broadly in that territory than elsewhere, and this statement is made despite the recent rapid increase in this application in Florida and certain other Gulf sections.

The reasons for this extensive development in the far West are not difficult to find. Climatic conditions prevailing west of the Rockies, influenced by the warm Japan current, show few instances of great temperature extremes. Therefore, the range of difference between outside and inside temperature is very limited, and the heating problem becomes thereby materially simplified. A second and highly important factor is the extensive hydroelectric development found in that section. It is a known matter of fact that some Western power companies have 100 per cent hydro development, and the usual ratio of hydro to steam is very high. These extensive hydro properties frequently have made possible energy generation at extremely favorable costs, these costs having been stated to be as low in some instances as four-tenths of a cent per kw-hr. at the power house bus bars. Transmission costs of course have had their effect on total energy costs, but the net delivered cost of electricity has remained favorable.

A third factor of importance has been the fact that many Western power companies have had to pioneer a virgin field not densely populated and have been forced to advanced methods of load-building to compensate in part for the heavy capital investment required for economic and economical capacity development.

The net result of all of these conditions has been a generally not unfavorable attitude among Western power companies — expect in certain dual utility instances — with regard to electric heating, and a load has been developed that on careful analysis has produced much interesting information for central-station executives. The experience of Western power companies, therefore, should be of interest and value to all officials concerned with electric load-building.

A recent article in the National Electric Light Association Bulletin (April, 1925, p. 229) reads in part as follows: "Probably many of us know of the study and investigation into the commercial possibilities of electric house heating, conducted recently by the Smithsonian Institution at Washington. Their summary of the situation was crystallized in the opinion that 'electric heating of houses from an economic viewpoint is impossible.' The Public Utilities Commission of Idaho, in their 'Opinion on Electric Heating,' said this: 'We all know that electricity does produce heat, and we all realize and appreciate what a wonderful thing it would be to dispose of our coal piles and ash pits, and smoke, dust and cinders, and would, therefore, fain think it practicable. But a most cursory study of the subject either from the standpoint of thermal dynamics, or social or economic science, shows that it is utterly impossible.'" This article goes on to say that "these Idaho investigations were concerned also with the investment that would be needed for electric house-heating equipment. In this connection their report continues: 'This should, in itself, readily demonstrate the impossibility of rendering heating service, because it means that for the small five or six-room house, costing from two to three thousand dollars, according to finish, a heating plant costing approximately $3,400, must be provided in order to heat the house by electricity. Obviously no sane individual would equip a house with such a plant, and no more can the public utility corporation make the invest-



Typical load curve of all-electric apartment house. Superimposin

ment for him.'" Unfortunately the article above quoted does not continue and make clear the circumstances surrounding the report of the commission referred to. To do so would make the matter appear in a very different light. It is interesting to note, in passing, that there is not on record a single house of the size mentioned in the quotation wherein the electric heating plant has cost, including wiring, anywhere near one thousand dollars, and it is further interesting to note that far from being impossible from the standpoint of social or economic science, electric heating is being applied in increasing volume and with growing satisfaction.

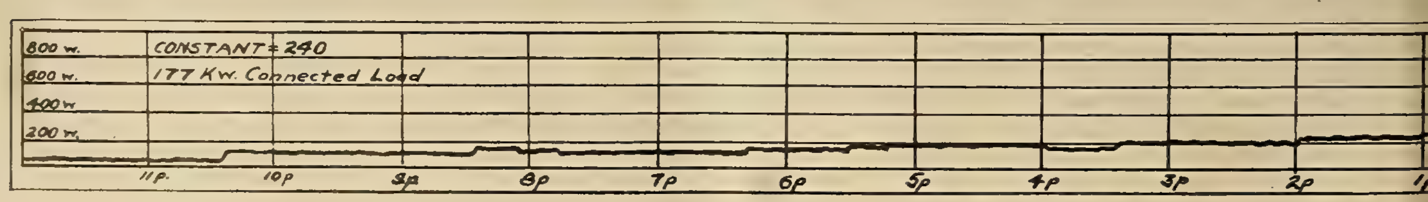
It does indeed seem difficult to understand why such specific attempt should be made generally to discredit a load that has been found to be not only practicable but attractive as well, while being at the same time economical and satisfactory to the consumer. In the West it has been found that the cost of wiring for electric heaters is about one-half of the cost of the heaters themselves and that an adequate electric heating system for an average six-room house costs about $300, exclusive of the wiring. This is based on six heaters at an average price of $50 each. The wiring, if done at the time the house is being built, averages about $25 per circuit, based on one heater per circuit. If the wiring is done after the house is completed it has been found to average up to $45 per heater circuit. These figures are taken from nearly six years' experience and from literally thousands of installations. Therefore, they may be accepted as representing true averages. The heater costs are derived from these same installations and include both portable and wall-type heaters of 2-kw. capacity or greater, up to 6-kw. No reference is made in this article to heaters of less than 2-kw. except as concerns bathrooms and very small rooms where 1-kw. or 1.5-kw. heaters have been ample in capacity for the maximum heating requirements of a particular installation. The so-called "lamp socket" or 660-watt heater is not taken into account in this article or in the figures given.

The statement has been made that "the heating of rural homes with electric energy is not within the realm of the practical" and that "it has been found by actual test that about 60,000 kw-hr. of electric energy would be required per annum for the heating of an eight-room, 16,000-cu. ft. capacity house." A careful study of meter records fails to reveal any Western house of eight rooms that is using 60,000 kw-hr. per year for **all-electric** service, which includes heating, cooking, lighting and water-heating. Instead of this would-be terrifying amount, the average is about 12,000 kw-hr. in California and sometimes does reach 18,000 kw-hr. per year. In this connection it should be borne in mind that there is a vast difference between these figures and the consumption of energy for lighting alone.

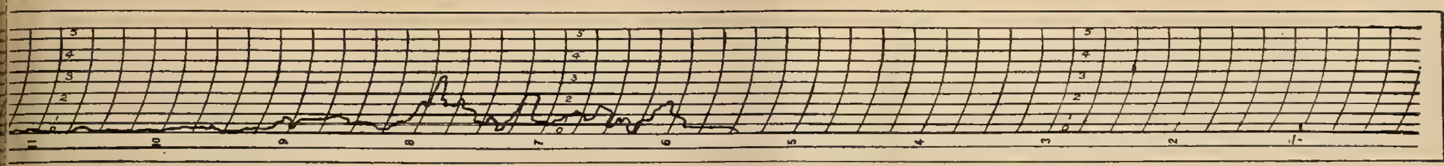
Many all-electric homes, using only electricity for cooking, lighting, heating and water-heating, have average monthly energy bills of $20 to $25. For six-room houses this is a high average, and actual experience often shows much lower average bills. Houses of nine rooms show a high average of $30 per month for all-electric service. When the average lighting bill of $7.50 for a house of this size is deducted from this figure it shows a reasonable cost for cooking, heating and hot water. Going a step further, the average monthly operating cost for an electric range in an average family of five people has been found to be $5.25. A total deduction, therefore, of $12.75 brings the average heating and hot-water cost down to $17.25 per month. These costs are based on rates as follows: First 30 kw-hr. (average) 7c; next 150 kw-hr., 3½c; all over 150 kw-hr., 2c. Hot-water costs vary greatly, according to individual family requirements and according to the construction of the house. So do heating costs. In general it has been found that hot water costs as much as air-heating, and continuous hot water often has been found to cost as much as all other electric service on the premises.

The all-electric home has proved so satisfactory that many real estate tracts are being fully electrified and subdividers are, in other instances, wiring or installing conduit for complete electrification at a later date if home buyers desire. Still other builders are even cutting recesses in the wall for later installations of flush-type heaters and are papering over these recesses if the equipment is not installed at the time of building. This procedure has occurred in many instances in spite of and not because of the power company. It has been brought about by the extreme satisfaction noted on the part of those who are occupants of electrified residences and by the consequent growing demand for this type of home.

Electric heating load is always at unity power factor. There are few sections where some heat is



Electric heating load in an automobile paint shop, showing the consistent character of the load.



em load will give a picturization of the value of this type of load.

not required at some time during every day of the year. Generally this demand is at an off-peak hour. It has been found that the installation of electric-heating systems has caused consumers to demand heating service more often, with a consequent favorable effect on revenue and an added justification for plant investment. The load most often is carried in the early morning and late afternoon and early evening. It thus occurs before and after the industrial load and overlaps only the lighting. No load condition without some overlap has yet been developed. The load normally can be delivered with only slight increase in local plant, and the increased consumption per meter lends to the attractiveness of this service. The load characteristic presents a strong argument in favor of its development. The consumer's satisfaction lends to the strengthening of public relations.

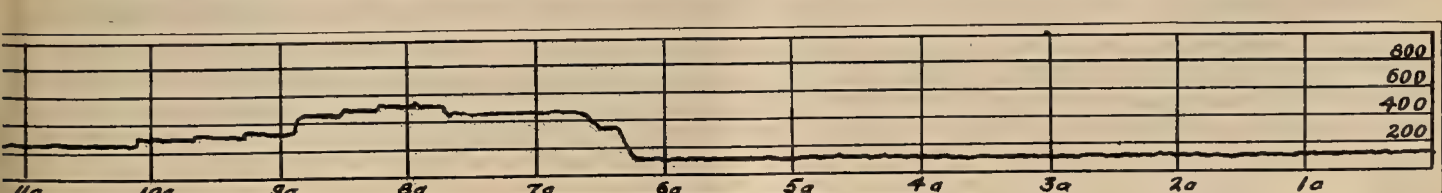
Air-heating installations average about 18 kw. per six-room house. All-electric homes of this size average about 30-35 kw., or 40-48 hp. connected load. This load equals or exceeds that of many small industrials, shows much better load characteristics and often is taken at a more favorable rate. Electricity, unlike gas, involves no storage problem. The domestic gas-heating load is already a burdensome problem on account of its winter-peak characteristic, and great effort now is being made by at least one company to develop a gas load at a special low rate that will fill in the summer valley. In those states where irrigation is common the peak electric load frequently comes during the summer irrigation season while the valley occurs during the winter. Electric heating serves to counter-balance this condition and to raise the level of the winter load approximately to that of summer. It therefore materially helps the system load factor and increases the value of plant investment.

Electric water-heating is a valuable part of the heating load. Energy consumed for this purpose forms a large part of domestic electric bills in those houses equipped with electric water heaters. In the usual residence equipped with a heater thermostatically controlled and using continuous hot-water service, this load floats on and off periodically. In systems so constructed that only a portion of the water in the tank is kept hot all of the time, the balance being controlled by a manually operated valve, the effect on the line is very slight and even where the whole tank is kept hot the floating load seldom exceeds 5 kw. In larger residences, apartment houses and other large buildings it is possible to install water-heating systems operating at nearly 100 per cent load factor, thus creating an ideal load which is entitled to a low rate on account of its high revenue-earning power per kilowatt-year. In all-electric apartment houses this figure often reaches $45 to $50 per kilowatt of demand, the maximum demand being about 40 per cent. Water-heating has produced $94 per kilowatt of demand per year. These earnings command attention.

Apartment houses electrically heated show an attractive load diversity, this diversity increasing as the number of apartments increases. Cases are at hand where service is being supplied from transformers having only 40 per cent capacity as compared with the total connected load. Electric heating is now in demand for banks, schools, theaters, hospitals and other public buildings as well as for residences. It doubtless has better load characteristics in domestic than commercial application, but it has been found profitable even as a daytime load.

Opponents of electric heating often quote, in many cases without reference to their antiquity, various reports of commissions and individuals that have been issued to cast reflections upon this class of business. It is not so very many years ago that opposition of similar character was advanced against the electric cooking load. How erroneous, and consequently how futile, this opposition was is evidenced by the fact that one Western central station recently placed one order for over a thousand electric ranges, most of which already were sold to the consumer before they were purchased from the factory. For the central-station industry to make the same mistake twice—namely, to oppose the development of business that is mutually advantageous—would be to cast discredit upon the brains of that industry.

The electric heating of homes and other buildings is so attractive from the consumer's standpoint that this load will be developed in spite of—if it is not developed with the assistance of—the central station. Executives will do well to study the situation carefully and to assist in the intelligent development of a service that produces comfort, satisfaction and good will and that at the same time shows attractive earning power for the capital invested.



f product and reduced time of process have made electric heating for this purpose a popular form of application.

CENTRAL STATION CONSTRUCTION OPERATION AND MAINTENANCE

New 60-kv. Substation Completed at Spokane, Wash.

East Side Substation of The Washington Water Power Company Involves Interesting Construction Features

By RICHARD McKAY, Engineering Department, The Washington Water Power Company, Spokane, Wash.

The new 20,000-kva. substation of The Washington Water Power Company is located east of the city of Spokane and just south of the Spokane River. Right-of-way was obtainable north and south from this point so that all high-voltage lines entering Spokane eventually can be brought into this substation. The location is close to the probable center of power load incident to factory and industrial development. At present four 60-kv. lines, one from Long Lake station, one tie to the old Twenty-ninth Avenue substation, one tie to Post Falls, and a feeder to the Palouse district enter the station. Two 13-kv. tie lines to the old Post Street substation and five 13-kv. feeders leave the station.

All structures are of wood and all lines entering are on wood poles. However, this substation has been laid out so that when it reaches a large size, due to increase of load in Spokane and the bringing in of power from sites now undeveloped, it will not interfere with the construction of a steel substation on this site.

The single 60-kv. bus is 3/0 stranded copper with each wire strung as a span from the two ends of the structure with five Hewlett type strain insulators. The bus is also supported between bays by post-type insulators made up of four Jeffery DeWitt post-type units. Taps to the bus are of 1-in. galvanized iron pipe, but from oil circuit breaker and lines to disconnects is 3/0 stranded copper. An oxide film lightning arrester will be mounted at one end of the 60-kv. bus structure and connected to this bus. The 60-kv. oil circuit breakers are General Electric 70-kv., type FKO-136, and are equipped with one double-ratio current transformer per phase for relay operation. The disconnecting switches are made in the shops of The Washington Water Power Company, using three Jeffery DeWitt post-type insulators for each stack.

No oil circuit breaker at present is installed in the 60-kv. side of the transformer bank, but the charging current will be broken by a 3-pole air switch of Pacific Electric manufacture.

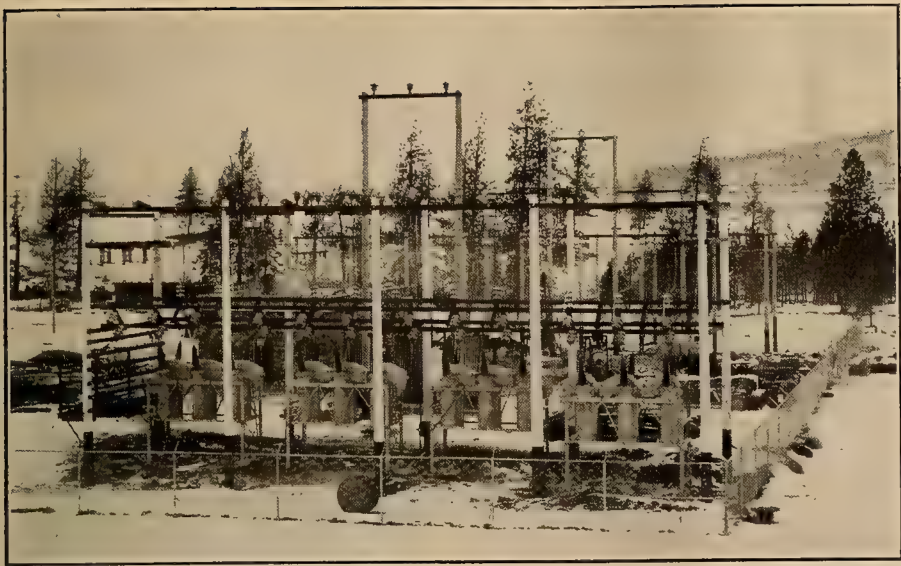
The transformer bank is made up of three single-phase, water-cooled units with one spare, each rated 6,667 kva., 110,000 or 55,000 to 13,800 and 6,900 volts. They will be operated for the present delta-wye with the two halves of the high side winding in parallel. The normal rating on this winding is 110,000 volts or on the two halves in parallel 55,000. However, the transformer was designed to operate on 115 per cent excitation or 63,600 volts, giving 13,800 volts with the 6,900-volt winding connected wye. Later, the line from Long Lake station will be changed to 110,000 operation, and this bank then will be operated delta-delta 110,000 to 13,800 volts. Water-cooled transformers were selected on account of cost and the fact that abundant water suitable for cooling could be obtained from a shallow well dug at the substation. Duplicate pumps each large enough to supply water for two transformer banks are installed. They are driven by 10-hp. squirrel-cage induction motors which are started direct on the line with knife switches.

A water-flow alarm is installed to sound a Klaxon and give a light signal if the flow drops below a predetermined value. The outgoing water flows into a pipe with an adjustable valve in the bottom of it. Off this pipe is tapped a small pipe leading to one end of an iron U-tube filled with mercury and with a float in the other leg of the U-tube. The float when it rises will tilt a mercury connection tube which rings the alarm and gives a lamp signal. The head in the pipe into which the outgoing water discharges can be adjusted by the valve in the bottom of it for any flow. When this flow decreases, the water head drops and the mercury level in the U-tube is lowered, tilting the mercury tube and giving the alarm.

A duplicate 13-kv. bus is installed with disconnecting switches for selector switch and oil circuit breakers in the lines and transformer bank. The buses are of 1,000,000 circ-mil bare copper strained from the ends of the structure with Hewlett type strain insulators and supported between bays with Thomas 27-kv. pin-type insulators. This bus has been installed several weeks and is very neat in appearance with no noticeable sag. Taps to the bus are 3/0 stranded copper. An oxide film lighting arrester will be installed on each bus.

All 13-kv. disconnects were furnished by the Maxwell Engineering Company. The insulators are Thomas pin-type,

East Side substation of The Washington Water Power Company at Spokane, Wash., showing the station under construction. The 60-kv. structure at the left is completed, while only the framework for the 13-kv. transformer and bus structure appears at the right. One of the transformer tanks is on the ground at the right

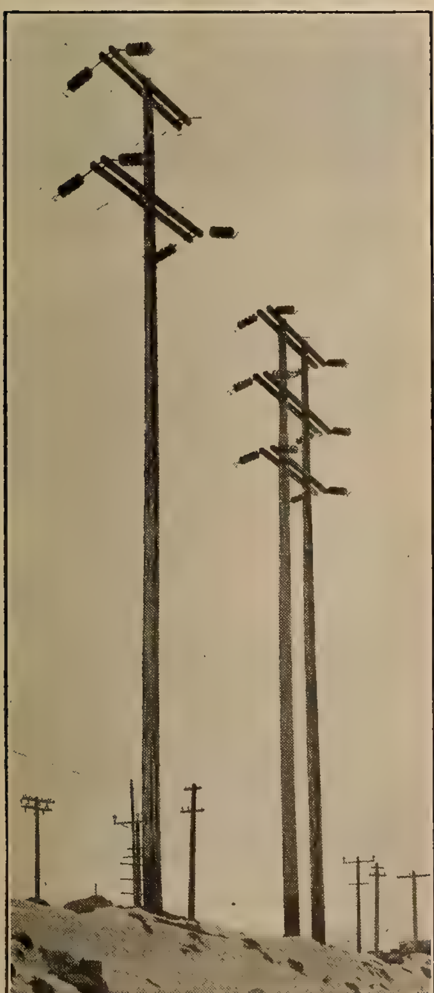


Showing the 60-kv. bus structure and oil circuit breakers at the new East Side substation of The Washington Water Power Company, at Spokane, Wash. It will be noted that all of the structures are of wood. When load requirements demand, a larger station layout will be constructed of steel.

27 kv. The line oil circuit breakers are General Electric Company, 15-kv., FHKO-136, and the transformer breaker is General Electric FHKO-39.

All breakers on the 13-kv. and 60-kv. are operated manually but are designed so that they can later be equipped with motor-closing mechanisms. The breakers are tripped from a 12-volt battery.

The switchboard was furnished by the Western Electric Company and is equipped with Weston instruments. Westinghouse type CO overload relays with two circuits are used, one to trip the circuit breaker and the second circuit for bell operation.



Dead-end structure on 60-kv. line on last pole before entering new East Side substation of The Washington Water Power Company at Spokane, Wash. The span from this tower is slack-sagged to reduce the stresses on the bus structure.

Unsafe Practice to Wear Safety Goggles Over Eyeglasses

By W. E. RICHMOND
San Diego Consolidated Gas & Electric Company, San Diego, Calif.

One of the largest manufacturers of optical goods for some time has been making efforts to put over the idea of fitting safety goggles with prescription lenses. This is sound safety practice and deserves encouragement.

From the safety point of view the workman who has to wear glasses all the time is, because of that fact, subject to greater hazards than the man who normally does not wear glasses. When, because of dangerous work, a man wearing glasses must put goggles on over them, his risk of injury at once increases.

Most men who wear glasses continually, especially those who work over cutting wheels, or other machines, have one pair for work and another pair to wear at home because in one way or another the "work" glasses often are damaged. To put on goggles over the work glasses is never safe practice for mechanical reasons, if no other. Nor can this custom be made safe. However, the fitting of prescription lenses in goggle frames and the exercise of proper care in fitting these frames to the contours of face and head of the man who is to wear them, makes for the utmost in comfort and safety that can be provided by such devices.

Care should be used, too, in fitting goggles to individuals who do not wear glasses. If properly fitted, and comfortable, goggles are more likely to be worn when needed than if they are "too uncomfortable to wear."

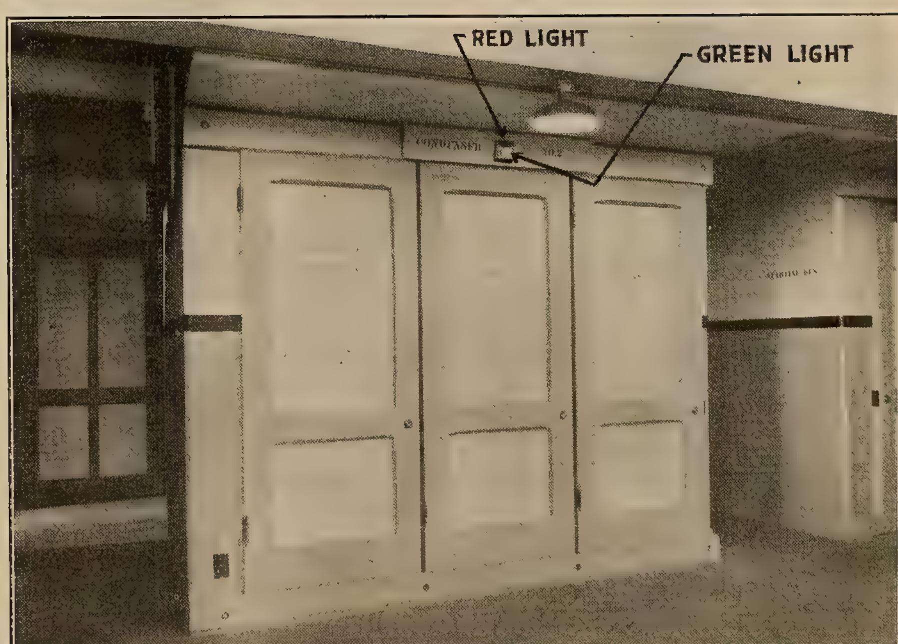
Hubby's Part

"You admit that you heard the quarrel between the defendant and his wife?"

"Yes sir, I do," said the witness.

"Tell the Court what the husband seemed to be doing."

"He seemed to be doing the listening."—Two Bells.



Pilot lights on disconnect-switch cell structures at Vaca substation of the Pacific Gas and Electric Company. A red and green light connected in series with the pilot lights on the switch board in the control room tell at a glance whether the oil breaker on the circuit in question is open or closed. The operator going to carry out switching orders is thus given a check indication as to oil-switch position right where he is to do the switching. It will also be noted that the cells are provided with tumbler locks, the key to which is kept in the operating room. This serves as another safety precaution.

Transmission-Line Pole Nearly Wrecked by Woodpeckers

Many different conditions contribute to the shortening of the useful life of transmission-line poles. By far not the least of these is the species of woodpecker whose native habitat is in the neighborhood of Atascadero, Calif. It so happens that the Midland Counties Public Service Corporation has a 66-kv. transmission line traversing this locality. Further, it is the case that this region is one in which the California live-oak tree flourishes.

Disastrous results caused by ambitious woodpeckers.

The thrifty woodpeckers, being quick to appropriate any and all conveniences placed at their disposal, for several years have used many of the transmission-line poles as storage warehouses for acorns. A typical example of the results of this practice is shown in the accompanying illustration. Due to photographic limitations it was impossible to show the full length of the pole.

It will be noted that the pole literally is peppered with small holes into which have been driven one or two acorns. In addition to this several cracks may be noted. They are due to the swelling action of the acorns that takes place when they get wet. The worst single break in the pole shown does not appear in the picture but is lower down. There is a split which extends from a point about 10 ft. from the ground clear down to the ground line, at which point it involves a third of the pole. Each season this crack is widened by the swelling action of the acorns which later on, in the dry season, contract again and drop down deeper into the split. Following this along comes the woodpecker and again drives the space full of acorns in readiness for the next wet season. The process appears to be limited only by the length of time that the pole will continue to carry its load.

Up to the present time no adequate means of combating this nuisance has been found, although S. F. Platt, district electrical foreman, has given much thought and study to the situation.

Thrust-Bearing Trouble Cured by Greater Oil Pressure

Trouble with a thrust bearing on a 7,500-kw. horizontal turbine unit in an Eastern power plant was overcome by changing the bearing so that the oil supply was received from the hydraulic governor pump instead of from the main bearing-supply line. This trouble at first was attributed to the oil holes in the bearing having been made too small; consequently they were enlarged. As this did not correct the difficulty the style of the bearing was changed, also without success.

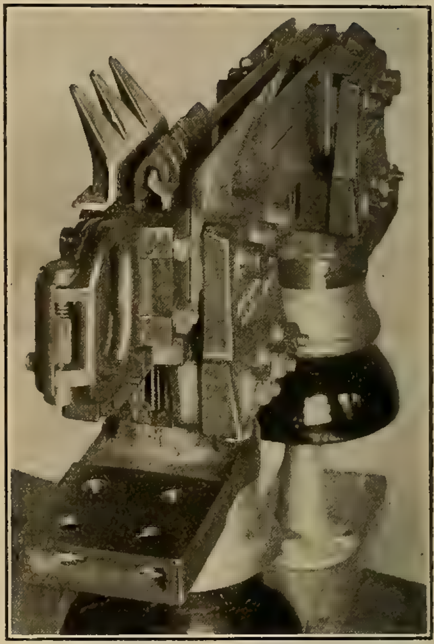
After a more careful study it was found that the trouble was due to dirty steam, which loaded the buckets with mud. Although this mud was removed periodically from the buckets, the bearing trouble continued. A higher oil pressure upon the thrust bearing was recommended. Accordingly the piping was changed so that the supply of oil was taken from the hydraulic gear instead of from the line serving the rest of the bearings. This connection more than doubled the oil pressure at the bearings. Subsequent to this last change no further trouble has been experienced.

Rat Ties Up Carlines.—A 30,000-kw. steam-driven, turbo-generator in the main power house of the Interborough Rapid Transit Company of New York City recently was wrecked by a short circuit caused by a rat gnawing through the insulation of one of the generator leads. The windings were demolished completely, according to the report. The intensity of the current delivered to the short was so great that the oil circuit breakers of several of the generators were damaged in interrupting the current flow. Complete shut-down of the plant for more than an hour resulted.

Disconnecting Switch Completely Full-Floating

Something new in disconnect-switch design has been brought out by the Pacific Electric Manufacturing Company of San Francisco. In an endeavor to overcome the complaint common to this type of switch, namely, its heating under heavy load due to poor efficiency at the contacting surfaces, the new switch has been made entirely "full floating."

This term seems best to fit the case, for none of the contacting parts are fastened rigidly to the main casting at either the jaw- or hinge-end of the switch. The accompanying illustration shows a 3,000-amp., 11-kv. sample of this type of construction. It will be observed in this case that triple jaws are used and that correspondingly there are triple contact shoes at the hinge. Units of a smaller capacity make use of only one or two jaws as may be required. The central contacts of the jaws are also of unique design in keeping with the rest of the unit.



3,000-amp., 11-kv. "full-floating" disconnect switch which is completely self-aligning.

Each of the 12 pieces of the jaws is free to move, within limits, in any direction. In other words, each is independently self-aligning. Thus it would seem that the only thing necessary to produce a 100 per cent contact would be that the contacting surfaces should be ground carefully at the time of assembly. Jaw-pressure is supplied by strap springs fitted into the castings in such a way as not to restrict the self-aligning feature. Electrical contact between each jaw section and the mounting casting is through flexible copper ribbon riveted into place. No soldered connections are used.

The locking clip is actuated to permit the opening of the blade by merely inserting the switch-stick hook through the ring appearing in the central foreground of the illustration in a direction from right to left. This action causes the plate covering this ring to swing on its spring hinge. This plate carries the latch. The company recently has issued a folder describing this device in detail.

A Method of Calculating Electrolysis Depreciation

Means of Determining Rate of Decay in Metals Subject to Electrolysis Offered to Fill Urgent Need

By B. A. WILLIAMSON, Electrolysis Engineer, Los Angeles Gas & Electric Corporation
Los Angeles

The development of all engineering sciences in theory and practice has followed the trend set by commercial requirements and is based upon the discovery and appreciation of basic physical relationships, which progressively become stepping stones. Electrolysis engineering, which is of recent origin, offers no exception to this general rule.

Since electrolysis is a destructive agency the chief commercial considerations have to do with its cause, measurement and mitigation. While the principles involving the cause and cure of electrolysis now are fairly well understood, it has been heretofore difficult, if not impossible, to measure the rate of decay, either from a physical or a financial standpoint. In fact, research work has been directed in the past toward finding this rate from a physical standpoint, that is, finding a means for measuring the current which causes corrosion and the weight of iron this current will decompose. Satisfactory progress having been made along this line, the foundation now is laid to take an advance step to find a means for calculating the rate of decay from an investment standpoint. It is obvious that when a pipe line loses a certain percentage of its weight due to electrolysis there is a depreciation of the investment greatly in excess of the percentage of weight loss. There is an urgent need for a means to figure this depreciation since the question of undertaking electrolysis mitigation and the allowable cost thereof should be decided upon the basis of the depreciation of the investment caused by the vagrant current.

The method of solution submitted in this article is based upon preceding research work to which reference has been made. It will be necessary briefly to review this previous work since it is the starting point for the present investigation.

Faraday, in his well known laws of electrolysis, laid the foundation from which it is known that a direct current of one ampere-year quantity will decompose 20.5 lb. of iron. Present-day research engineers have shown that the above figure is subject to great variation when electrolysis occurs on engineering structures in contact with the soil. The ratio of the actual corrosion under any particular condition to the theoretical corrosion under ideal circumstances is called the efficiency of corrosion and varies from 20 to 140 per cent in saturated soils. (Technologic Paper No. 25, Electrolytic Corrosion of Iron in Soils, by Burton McCollum, Associate Physicist and K. H. Logan, Assistant Physicist.) This work, though valuable, could not be used for calculating electrolytic losses until there was developed a means for measuring the intensity of current discharge per unit of area from the surface to the underground conductor. This troublesome problem now appears to have been met by Burton McCollum, electrical engineer, U. S. Bureau of Standards.

It will be noted that there now exist methods for figuring or estimating the loss in weight due to electrolysis. This includes a means for measuring the current being discharged and permits the assumption of an average figure of the loss in weight per ampere-year. This method is of little value other than as a basis from which to figure the financial loss. This fact must be apparent when it is considered that the life of a pipe is spent when it will no longer confine a gas or fluid under pressure and that electrolysis in its corrosive action is more comparable to a drill press than to a lathe.

There remains the problem of the unequal distribution of electrolysis or the "pitting effect." It is desired here to suggest that the American Committee on Electrolysis, or other parties who may be in a postion officially and otherwise, consider the "pitting" phenomenon with special reference to the subject of depreciation. Until a better way may be found, the following method is offered:

The ratio of the initial weight of a pipe to the loss of weight due to vagrant current to the time for its breakdown is called the "factor of electrolytic concentration." For a 2-in. wrought-iron pipe it was determined in the following manner: A pipe weighing 37.5 lb. capped and made air-tight, was installed and subjected to electrolysis in the ground. Air was introduced under pressure through an auto-tube valve. When the pipe broke down, as evidenced by its no longer holding air pressure, it was removed, cleaned and reweighed. It was found that the loss of weight was 2.5 lb. Hence the "electrolytic concentration" was 37.5÷2.5, or 15. This is interpreted to mean that a 2-in. wrought-iron pipe line when subjected to electrolysis may be expected to be no longer serviceable after having lost 1/15 of its initial weight. In other words, while the corrosive action of one ampere-year quantity of electricity is in the neighborhood of 17 lb. of iron, where the efficiency of corrosion is assumed to be 85 per cent as an average, the effective corrosive effect in depreciating the investment is 15 times this rate, or 255 lb.

Proper Use of Fire Extinguishers Shown by Placards

By W. E. Richmond
San Diego Consolidated Gas & Electric Company, San Diego, Calif.

With the usual profusion of various types of fire extinguishers that collect around an old station during its operating life there is danger of them being put to the wrong use. At one particular station in southern California there is a collection representing 10 styles and 3 different types. Two of these types are suitable for use only on fires of other than electrical character or origin. The third is useful for all fires. None of these extinguishers ever should be used on a human being except in the direst emergency.

To obviate the possibility of incorrect usage a plainly marked legend has been prepared and mounted in a suitable protecting frame to be hung prominently at each extinguisher station. Through the use of these signs and by trying to mount extinguishers of a type suited to certain uses near to the equipment or apparatus which might necessitate their use, much difficulty has been overcome.

TETRACHLORIDE

For Electric Fire

And Any Other Fire

SODA ACID

Not for Electric Fire
(Contains Water)

FOAMITE

Not For Electric Fire
(Contains Water)

For Any Non-Electric Fire And

Especially For Oil Fire

The small wooden frames used for these signs are about 4 x 6 in. in size. Each is fitted with a screw-eye or two small hooks, depending upon which is the more convenient for the location of each sign. The different signs are shown in the accompanying illustration. Visual prominence may be obtained by using sharply contrasting colors.

Electrically Speaking

"Are you Mr. Pere?"

"Yes, I am Pere."

"Volt is my name, sir."

"Well, wire you here?"

"I'll cut it short, cir-cuit I marry your daughter?"

"No. I'll be switched if you can! And until I get a line on you I forbid you to meter again."

"Arc, sir! Brush me not aside! You can't phase me!"

"What! How dare you make light of my resistance?"

"Because I love Dyna mo' than oil the world, sir, and we are engaged."

"Engaged? Humph! How can you keep her in the station she's juice to?"

"Well, sir, we'll make our ohm with you, sir."

"I get you. Just step upstairs ammeter mother, Volt. Age is no interference if you can transformer opinions. But she's ill, so don't exciter."

"Thank you, sir. And no matter watthour current bills may be in the future I'll carry my peak of the load."

—Synchronizer.

IDEAS FOR THE CONTRACTOR

Melting Pots and Ovens Are Heated Electrically

Working Conditions Improved and Fire Hazard Decreased by Use of Electricity in Brush Factory

The use of electricity in manufacturing high-grade brushes was adopted by the Wolfe Brush Company, Pittsburgh, Pa., in 1919 for heating melting pots and ovens, and the step has been justified completely. It is felt that electric heat is helping maintain the quality standard and removing some of the cares and troubles of the manufacturing processes.

In the manufacture of brushes the composition which fastens each bunch of bristles into the holes in the wooden back is heated in a cast-iron melting pot, 18 in. in diameter and 8 in. deep, mounted in the middle of a work table. Three Westinghouse steel-clad heaters having a total load of 1,950 watts are fastened to the bottom of this melting pot. Asbestos cement 1 in. thick insulates the pot and conserves heat; this insulation is protected by a galvanized iron shell. Air is exhausted from over the top of the pot through a 4-in. galvanized pipe by means of a ventilating fan. The heat is controlled by a three-heat snap switch. The composition is melted on a high heating rate in the morning and then kept at the proper working temperature on a medium heating rate.

Since electric heat superseded gas for this process working conditions have been improved greatly, and fire hazard has decreased. Electricity provides a constant and uniform source of heat energy, which is advantageous.

The electric oven used for baking the brushes superseded a gas-fired oven. Electricity provides a reliable means of maintaining the proper temperature with a maximum amount of convenience and safety.

The ovens are used for vulcanizing the compound in which the brush bristles are set. The bristles first are arranged in thin metal ferrules with the root ends projecting about ½ in. The roots are dipped in cement and the ferrules then are slipped over them far enough to allow the proper insertion of the handle after the cement has been baked. The baking is done with the bristles in an upright position.

In order that the high quality of these brushes may be maintained, it is necessary that this baking be done at the proper temperature. Over-heating destroys the life of the bristles and makes them break off. It has been found that electric heat permits maintenance of a very close temperature regulation, between 216 and 230 deg. F.

The average charge consists of about sixty dozen brushes, weighing about 250 lb. per bake. The brushes are placed in the oven in the morning and baked ten hours. About three and one-half hours of this time is required for heating up. Before electric heat was adopted it was found that it sometimes took three or four days per bake in periods of low gas pressure. Since electric heat has been installed there have been no delays.

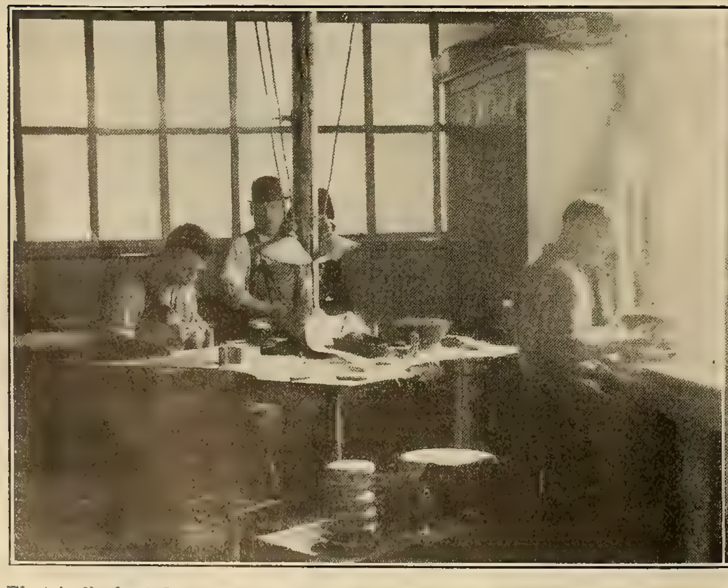
Electricity Is the Safest Form of Light, Heat and Power

Electricity is regarded as the safest form of light, heat and power by the National Board of Fire Underwriters. The following statement appeared in the report for the year 1923 that was recently published by them:

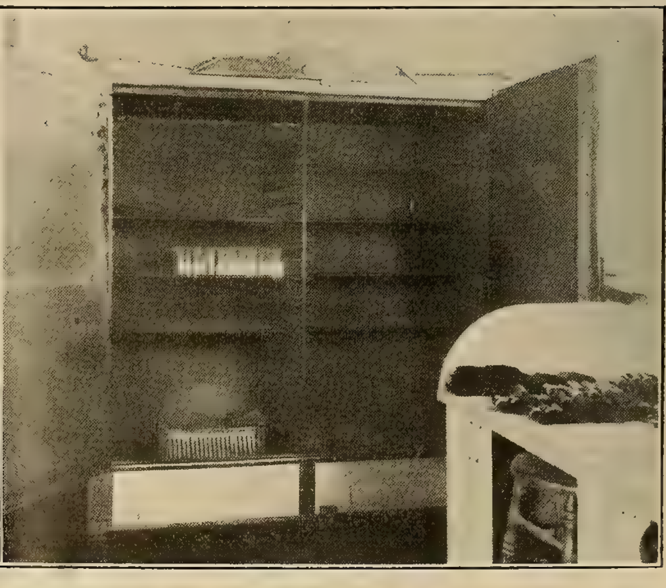
"Electricity, than which there exists no safer form of light, heat and power, when it is properly installed and used, exacted a toll amounting to $14,091,789. Hence, despite an actual jump of more than two millions it dropped back from fifth place where it reposed in 1922, to sixth, exchanging positions with Sparks on Roofs. In 1923 the boon of electricity was most grossly abused in Massachusetts where $1,175,420 in property was swept away. New York was the other "seven figure state."

"Of all the scores of ways in which electrical fires can develop perhaps none is so common as the condition usually termed 'crossed wires,' unless it be a broken connection or abrased insulation. By running electric wires through metal conduit, to begin with, much of the risk is eliminated. 'Doctored' fuses and overloaded circuits frequently cause trouble, too, as do extensions employing flexible cord wiring, which may easily be rubbed bare."

H. H. Fenneman has recently taken over the Ralph W. Reed Electric Company, electragists of 501 Castro Street, Hayward, and has changed the name to the Hayward Electric Company. The business will be that of contractor-dealer and will also display lighting fixtures. The plumbing business will be discontinued.



Electrically heated melting pot used for melting the compound that holds the bristles in the wooden holes



Electrically heated oven used for baking brushes. The maximum charge consists of 1,440 brushes. The length of bake is ten hours

Letters from a Secretary to a Self-Made Contractor

The First of a Series of Communications from a Man of Experience to His Friend Just Starting Out

San Francisco, Calif.

Dear Bill:

You have started out in life in your chosen work. I hope that you will enjoy your vocation and will prosper. Whether or not you do one or both of these things will depend largely upon yourself. If you respect the fundamental principles of business and conduct yourself with due regard to the rights of yourself, your customer and your competitor you are very likely to succeed. If you do not so conduct yourself I predict for you an early oblivion, for no man can break faith with his fellows and long survive. Unfortunately, the history of the electrical contracting business is filled with the records of untold thousands who have tried to business. However, I hope you will avoid the common errors of trying to beat down the quality of installation and of keeping the estimate so close to your cost that the profit is liable to be written in red ink instead of black. Just that little procedure has been the cause of many of those afore-mentioned wooden crosses. The fear of the general contractor and of the lower bid has driven many a well-intentioned man to the quicksands of low-priced competition. The result has inevitably been the same—a short life and a quick death.

The handwriting is on the wall, and all may read. The business death rate for electrical contractors as determined from Oakland, Calif., figures, for example, shows that—

26 or all of the 26 contractors who started in 1924 are still in business.
Only 26 or 50 per cent of the 52 " " " " 1923
Only 20 or 34 per cent of the 59 " " " " 1922
Only 21 or 30 per cent of the 71 " " " " 1921
Only 9 or 26 per cent of the 34 " " " " 1920
Only 6 or 17 per cent of the 37 " " " " 1919
None of the 16 " " " " 1918
6 or 13 per cent of the 48 " " " " 1917
5 or 12 per cent of the 43 " " " " 1916
2 or 5 per cent of the 38 " " " " 1915
19 or 14 per cent of the 135 " who started prior to 1915 are still here

140 or 25 per cent of the 559 who started are still so-called electrical contractors

All of which means that for every 100 contractors who start in business:

50 will be forced to quit during the 1st or 2nd year which will leave 50
16 more will cash in during the 3rd year which will leave 34
4 more will fold their tents in the 4th year which will leave 30
4 of those left will pass on in the 5th year which will leave 26
9 will be mourned by the jobbers in the 6th year which will leave 17
and so on until after nine years only five will be struggling where 95 took the count.

"beat the game" by skinning the job and everything else. They have even tried—successfully, for a while—to skin their customers. However, it takes longer to recover from the smart and sting of a bruise than it does to inflict the wound and the recollection of a "trimming" has lasted a long time in the memory of the customer. That accounts for the long lanes of wooden crosses in the business burial ground inscribed with the names of electrical contractors who have been suffocated by an unsavory reputation or have been annihilated by unbusinesslike tactics. You know that you may beat the doctor all your life but you cannot dodge the undertaker.

I do not want to preach to you for it wouldn't do any good; you will probably have to learn by experience. It is rather queer that normal human beings, in possession of their faculties, are not willing to learn from the experiences of others but that seems to be the case. Therefore, I presume you will make some of the same mistakes that have been made by many others in your

The fifty who quit in the first or second year claimed they "didn't have any overhead" . . . and now they haven't anything else either; the sixteen "wise guys" thought cost plus 10 per cent would "get by," but the jobber closed the accounts in red ink during the third year; the four who finished in the fourth year figured labor and material plus 20 per cent, so they stuck it out a year longer than the sixteen; the next four added 25 per cent to cost and lasted five years. Cost plus 30 per cent sounds like it's plenty, but the next nine can tell you it's only good for six years.

But the five who will last ten years or longer are the ones to follow. Study their methods and you will find that:

They never do a big volume for that's quick poison. They never "go down after" any job because they are not philanthropists. They figure labor and material plus 50 per cent, which will make a profit. They take an active interest in ASSOCIATION WORK.

Profit by these examples or you will follow in the steps of the 419 wise guys.

JOE MAGEE.

Contractor Makes Electrically Heated Water-Boiler

The problem of boiling clothes in connection with the family washing is one which frequently has confronted contractors in selling complete electrical homes. The problem recently has been successfully met by Clyde Chamblin of the California Electrical Construction Company of San Francisco and Oakland. Working in conjunction with W. Wesley Hicks, electrical manufacturer

Electric water-boiler showing heating unit and attachment cord. The draining faucet on the bottom of the boiler appears at the top of this picture.

of San Francisco, Mr. Chamblin constructed an electrically heated wash-boiler.

A 3-kw. 220-volt Wesix water-heater unit was installed in a copper tube which was placed in the lower part of an ordinary copper boiler. One-inch clearance from the bottom was allowed for circulation. An attachment cord and plug provide for the connection of the heating unit to a 220-volt convenience outlet. A faucet for draining the water was installed at the bottom of the boiler. This boiler has been in use for some time and is entirely satisfactory.

Creation of Three New Sales Divisions Announced by National Lamp Works.—Due to rapid progress in electrical development in the southern, southwestern and northern sections of the country, the National Lamp Works of the General Electric Company has formed the following new sales divisions: Southern lamp division, with headquarters at Atlanta, Ga., H. E. Huff, formerly in charge of the Cleveland district, general manager; southwestern lamp division, Kansas City, Mo., H. F. Viot, formerly manager of the Chicago district for the Shelby lamp division, general manager; and northern lamp division, Minneapolis, Minn., O. F. Stuefer, formerly of the Federal miniature lamp division, Chicago, general manager.

New Small Electric Range Placed on Market.—To meet the demands of apartment-house owners and the desires of a small family the Edison Electric Appliance Company, Inc., has placed on the market a new electric range that measures 24½ x 45 in. The range is equipped with two 1,000-watt hot plates and one 1,800-watt hot plate. Oven linings are full enamel of pebbled blue finish. New type of vent outlet and oven temperature control have been installed in the range. Radio-dial adjustment has been provided for oven-temperature control. The range may be secured with either open or enclosed elements.

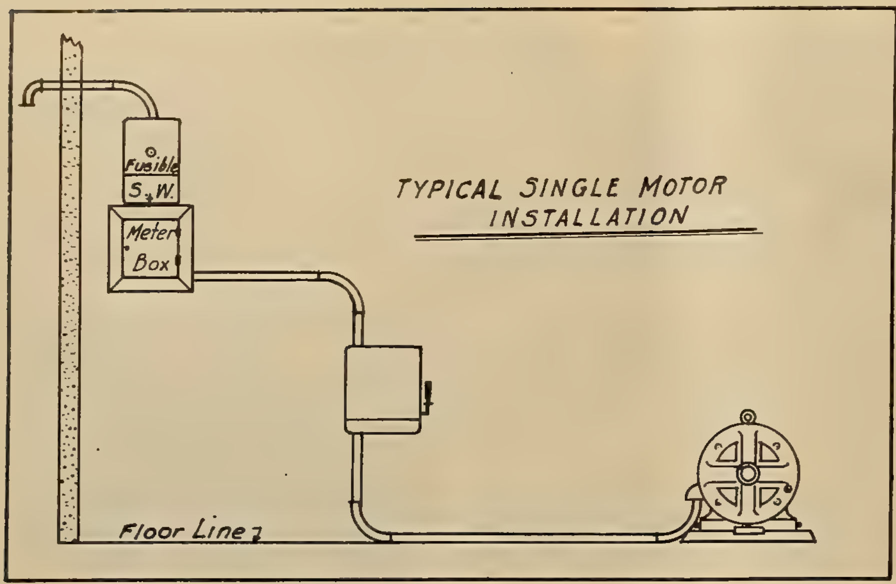


Fig. 1.

Safety-First Installations for the Electrical Contractor

California has been working for some time now under the Electrical Utilization Safety Orders of the Industrial Accident Commission of the state, and most contractors are quite familiar with the various orders as well as the changes that have been made from time to time.

The contractor doing building as well as industrial work usually employs men that are more or less experts in one line or the other, and when an industrial job comes up he places an industrial wireman on the job. This type of man is usually thoroughly familiar with the method of installing apparatus in a safe manner, but the man that is not thoroughly acquainted with the rules may not know just what should be done under certain circumstances.

Again, there is the contractor who has the same class of men that he uses on industrial as well as building installations, and these men take care of anything that happens to be the contractor's good fortune to install.

In order to keep clear in mind some of the more simple installations, the Journal of Electricity plans to show five different types of them laid out in simple form so that it will be easy to pick out the method for such installations.

Fig. 1 is the first of a series of five to appear in succeeding issues of the Journal of Electricity. It shows a single motor installation with all apparatus in sight of the operator; that is, the motor, the disconnecting switch and the starter. It will be noted that the incoming service enters the fusible disconnecting switch just above the meter box, thence to the starter, and on to the motor. The operator can trip the auto-starter and see if his disconnecting switch is in the open or closed position before he attempts to work on the motor or any connections included in the installation.

Contractors Make Valuable Use of Membership Lists

The Electrical Contractors and Dealers' Association of Los Angeles has made good use of a four-page pamphlet listing the names of the members, their addresses and telephone numbers. The front cover carries a message to the public stating the principles for which the association stands. The back cover gives a list of suggested electrical service for the home, containing outlets for the porch, kitchen, breakfast room, bedrooms, hall, reception hall, bathroom, dining room and living room. In a number of instances the height at which the outlet should be installed is suggested.

These lists are distributed from the Electric Club and by manufacturers, jobbers, and others in the industry. The association office, the members and the journeymen are the principal sources of distribution.

The K & R Electric Corporation is the name of the new firm recently incorporated with L. A. Kaplan, president, J. Kapelus, vice-president, and J. Rosenthal, secretary-treasurer. It has opened a new sales and display room at 2231 West Washington Street, Los Angeles, and will specialize in electrical contracting and electric-fixture manufacturing.

The Newberry-Pearce Electrical Company of San Francisco has been awarded a contract by the board of trustees of Healdsburg, Calif., to furnish and install a complete electric lighting system in the business district of that city. Forty-eight electroliers are to be erected. The system will cost the city $11,122.50. Work on it will begin at once.

Electrical Service Suggested for the Home

PORCH

Convenience Outlet for ironing machine motor—up 3'
Convenience Outlet for washing machine—up 3'.
Convenience Outlet for refrigerator motor—up 6'.
Convenience Outlet for electric flat iron—up 3' 6"
Convenience Outlet for ironing machine heater—up 3'

KITCHEN

Convenience Outlet for water heater—up 18"
Convenience Outlet for utility motor.
Bracket Light over sink.
Convenience Outlet and Switch for dishwasher.
Front door bell.
Back door buzzer
Switch for range—up 4'
Range Outlet—up 30"

BREAKFAST ROOM

Convenience Outlet for heater
Convenience Outlet for toaster, percolator, etc.

BEDROOMS

Outlet for dresser lights.
Convenience Outlet for heater, sewing machine, or vacuum cleaner.
Convenience Outlet for reading lamp, warming pad or milk warmer.
Convenience Outlet for curling iron.

HALL

Outlet for all night light

RECEPTION HALL

Convenience Outlet for vacuum cleaner.
Convenience Outlet for portable lamp
Telephone Outlet.

BATH ROOM

Convenience Outlet for vibrator, curling iron, hair dryer or shaving mirror up 4".
Convenience Outlet for heater—at base.

DINING ROOM

Convenience Outlet for stand lamp.
Floor Outlet for toaster, percolator, etc.
Convenience Outlet for heater.

LIVING ROOM

Convenience Outlet for piano lamp or phonograph.
Convenience Outlet for stand lamp.
Outlet for lights on mantel.
Floor Outlet for table lamp.
Convenience Outlet for heater.
Convenience Outlet for vacuum cleaner.

The Electrical Contractors & Dealers Association of Los Angeles

Composed of those Electrical Contractors and Dealers who stand for quality, service, responsibility and fair dealing, are firmly committed to the policy of the AMERICAN PLAN, as established by the Merchants & Manufacturers Association of Los Angeles. Your favorable consideration of those who stand for this great AMERICAN principle of industrial freedom, is respectfully requested.

First and fourth pages of pamphlet containing list of members of Los Angeles contractors' association. The first page is on the right of the dividing line. Note the electrical service suggested for the home. The reverse side of this sheet contains the list of members.

Architect's sketch of Beaty Building, Modesto, Calif., which will be heated by electricity.

Modesto Office Building to Be Heated Electrically

An office building, which it is believed will be the first one in California to be heated by electricity, is being erected in Modesto, Calif., by Jack Beaty. The structure will be a four-story brick and concrete building devoted to offices and store rooms.

The Beaty Building will have a frontage of 140 ft. on J Street and 100 ft. on Eleventh Street and will contain twelve stores and ninety offices. It will be possible to meter any group of stores or offices separately. Wallace H. Hubbert and Wieland Bros., Associated, of San Francisco and Modesto are the architects.

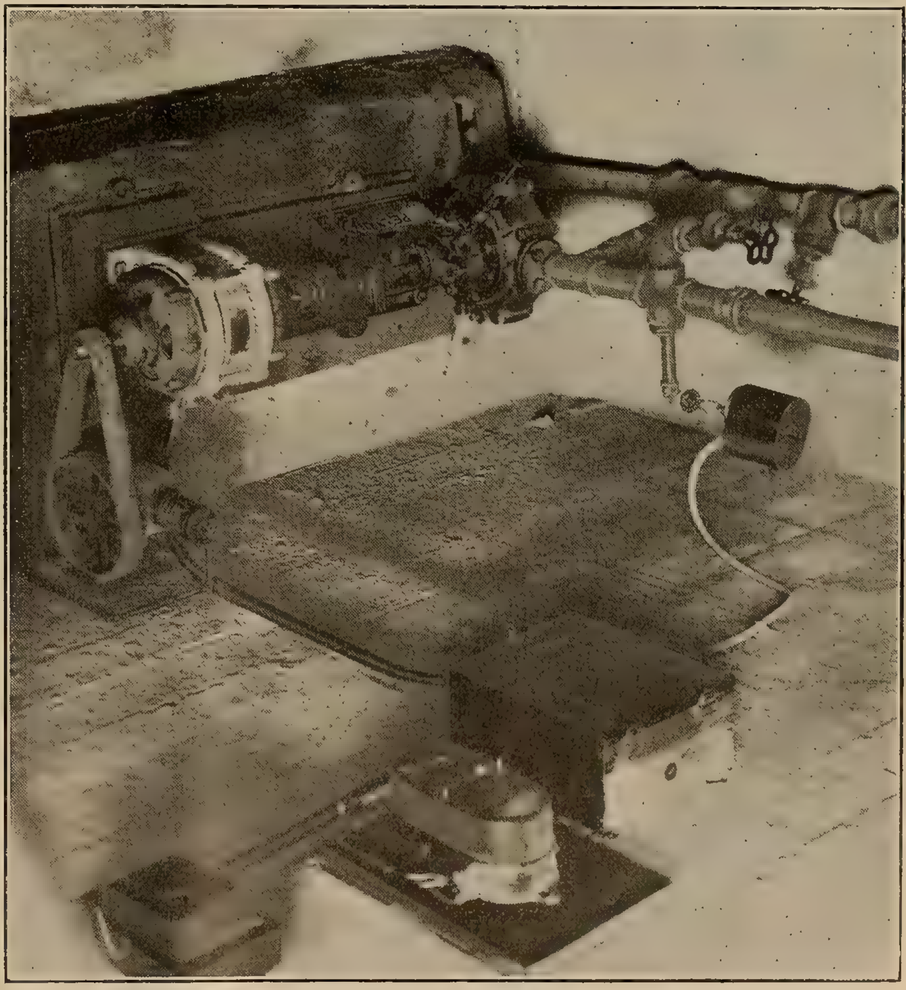
California Contractor Uses Word "Electragist" to Describe His Business.—The use of the word "Electragist" to describe the man engaged in the business of electrical contracting rapidly is becoming a reality in California. Roy Butcher of San Jose recently has had his name and address and the word "Electragist" painted on each side of his cars. This is the only description of his business that appears. Mr. Butcher believes that in this way people will realize more quickly the value of the trade name, and if they ask what an electragist is he has a splendid opportunity to sell the idea to them.

Panel on automobile of Roy Butcher, used to advertise the fact that he is an electragist

P. E. Doran, electrical contractor-dealer of Hollywood, Calif., has recently opened a new branch store at 8030 Santa Monica Boulevard, Hollywood. R. B. Patton, who has been associated with Mr. Doran for some time, will manage the new branch. The main store is on Hollywood Boulevard.

The Ohio Electric & Controller Company, Cleveland, recently has issued Bulletin No. 107 describing Ohio lifting magnets and discussing and illustrating their use in the iron and steel trades, also for magnetic separation of tramp iron from ore, cement, coal over conveyors or chutes, and their profitable application for handling pipe in warehouses, rails, billets, as well as iron, steel and scrap in bulk.

Pump Used for Supplying Irrigation and Pressure Tank Service.—The accompanying picture shows a 1¼-in. Type FD Pelton pump direct-connected to a 5-hp. U. S. motor installed in a concrete pit on the ranch of Fred Moffet, Ceres, Calif. The pump lifts water from 70 ft. to 123 ft. for irrigation and pressure tank service. The extended end of the motor shaft is used for belt-driving a small compressor. An automatic control switch may be noted near one of the discharge pipes; this starts or stops the motor as the water pressure reaches certain predetermined points. Note also the check valve which makes it possible to retain the tank pressure even though the pump is being used for irrigation service.



Electrical installation in a pit on a California ranch showing pump, motor, compressor and control equipment

BETTER MERCHANDISING

Record in Kitchen Unit Campaign Made by Idaho Company

What is believed to be a record in the Northwest in a kitchen-lighting campaign recently was made by the Idaho Power Company, Boise, when it sold 3,666 kitchen-lighting units in its field in southern Idaho and eastern Oregon where it serves 22,000 residence lighting consumers. This means that sales were made to over 16 per cent of the residential customers.

By way of stimulating interest in the campaign, contests were put on among employees of the company, with the result that in several towns on the system more than 40 per cent of the residences were equipped with kitchen units. Units were installed on a 15-day free trial and sold on terms of 75c down and 75c per month.

One of the window displays used by the Idaho Power Company to stimulate interest in its recent kitchen-lighting campaign.

SAM SHARP OUTSHARPED
Easy Come—Easy Go

By JOE OSIER.

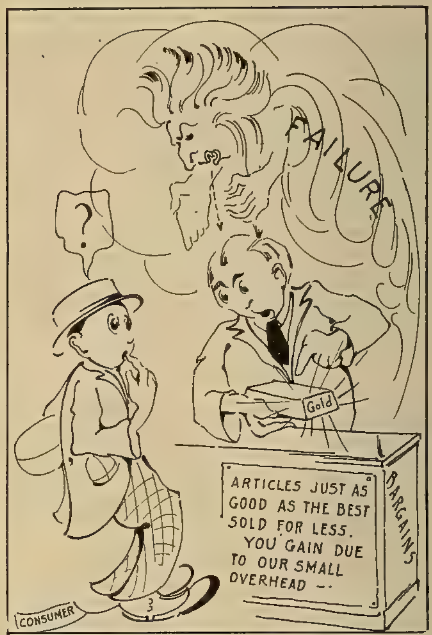
"A city that is built upon a hill cannot be hid" nor can a business based on double-dealing, trickery and sharp practices prosper for long. Sooner or later the submerging tide will set in, the waves of adversity roll high, break and recede carrying along the wreck of the institution and the owner who believed his iniquitous actions were hidden from the sight of his fellowmen.

Years ago Sam Sharp's electrical shop and store resembled the First National Bank at the Saturday rush hour. Customers were trampling one another into the terrazzo to get to the counter to spend their spondulicks and Sam—

Was growing round-shouldered from toting tin from his till.

"S'nothin' to't," says Sam. "S'like shootin' fish in a cistern. All a man needs to succeed in the 'lectrical game is an up-to-date store and shop, first class merchandise, A-1 salespeople, high-class workmen and advertising. I'll be golfing with John D., first thing I know."

And Sam's sayings were not idle boasting. He was riding on that beautiful boulevard leading to the Vista House, and everything was eggs in the coffee until—

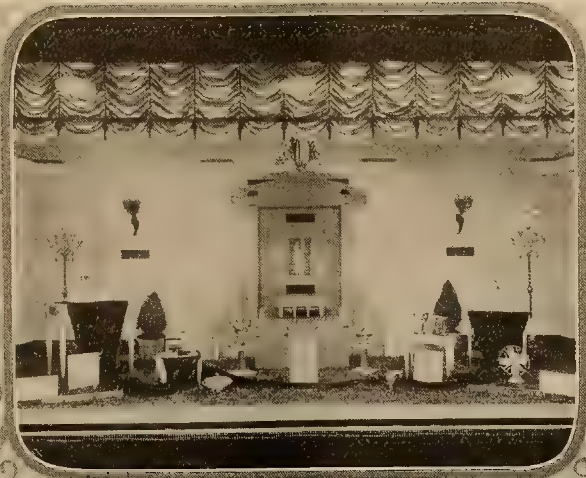


THE GOBLINS 'LL GET YOU IF YOU DON'T WATCH OUT!

He began to figure that he was giving his customers and his trade too much of a break. "My stock is too high-class," he figured. "I'm not getting enough velvet. I'm paying too much in salaries. I'm not grabbing mine fast enough," and, so—

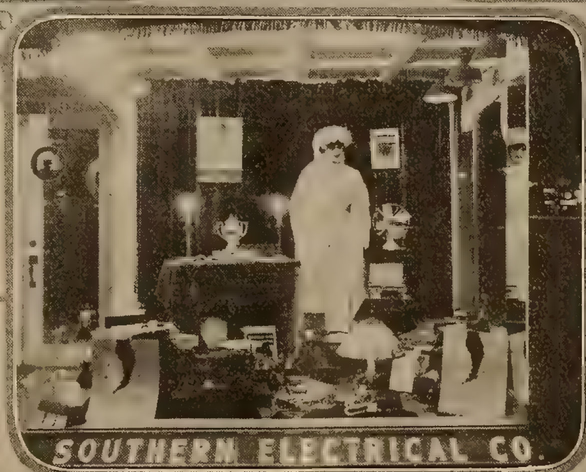
Sam Sharp, a man of the industry who had for years carried the light and been an example for many friendly competitors, executed a right-about face, heading directly in the opposite direction.

And the city that he had builded on the hill was an abomination, and men of the electrical industry, lifting their honest eyes from their tasks, looked upon Sam's city and Sam's folly and profited greatly thereby.



They Sold Gifts for June Brides

THE window displays in this group were used last year by California electrical dealers to call the public's attention to June Bride Week. The ideas in window decorating may serve as aids to those dealers desiring to put electrical devices in the new home of the June Bride of 1925. The experience of past years has proved the drawing power of the specially decorated displays which have increased consumer interest in the modern electrical appliances.



NEWS OF THE INDUSTRY

San Joaquin Company Announces 1925 Development Plans

The expenditure of $8,000,000 and the construction of a 28,500-kw. hydroelectric plant are included in the 1925 development program of the San Joaquin Light & Power Corporation as announced by A. Emory Wishon, vice-president and general manager. In this year's budget $1,250,000 has been alloted for construction work on the Balch plant of the Kings River project. (Journal of Electricity, April 1, 1925, p. 241.) This plant will cost $5,000,000 and be ready for operation Jan. 1, 1927.

In addition to the work on the new power plant, the expansion program includes the building of several new substations of large capacity, the enlarging of others and the construction of hundreds of short transmission and distribution lines throughout all parts of the ten counties served. Business and agricultural conditions in the San Joaquin Valley are recovering rapidly from the depression of 1924, and bumper crops have been assured by ample rainfall.

More agricultural load has been connected to the lines of the company this year than in any similar period in the history of the company. During the first three months of 1925, 11,000 hp. in agricultural motors was added, an increase of nearly 3,000 hp. over the same period of last year. During the coming year the company will have available 25,000 hp. from the Exchequer plant of the Merced Irrigation District. A contract looking toward this source of power was made several years ago. This will meet the growth in load until the completion of the Balch plant.

Tentative Electrical Safety Orders Hearing Dates Set

The Industrial Accident Commission of the State of California, Department of Safety, has prepared tentative Electrical Safety Orders for submission at public hearings, as required by law, before becoming effective. These orders are the result of the experience gained from a practical tryout of the "Proposed Electrical Safety Orders," which have been applied quite generally throughout California since they were distributed in 1922. They represent the work of the advisory electrical committee and the commission's engineers, who have been at work on them for many months. The rules apply to all work done by public utilities on private property, such as services, meter installations, industrial substations, etc., in addition to all electrical work done by electrical contractors. The public hearings will be held at 10 a.m., May 26, in room 137 State Building, Civic Center, San Francisco, and at 10 a.m., June 2, in Room 906 Pacific Finance Building, Los Angeles. After the hearings, the necessary changes and corrections will be made, and the Orders then will be printed in the adopted form.

The Electrical Safety Orders will supersede the Electrical Utilization Safety Orders, effective Jan. 1, 1917, and as revised July 1, 1917, and will be effective in places of employment over which the Industrial Accident Commission has jurisdiction.

A limited number of the tentative orders were printed and are being distributed. Copies will be reserved for the public hearings, and those who attend these hearings and who have not received the tentative orders will be supplied with a copy at that time. It is suggested that all interested in this work attend the public hearings and gain a first-hand knowledge of the requirements for safety which the Industrial Accident Commission proposes to make effective.

Mystic Lake Plant of Montana Utility Put in Operation

The Mystic Lake plant of the Montana Power Company recently was put in operation. The energy being furnished to Billings and the entire eastern section of the company's system, which hertofore has depended solely on power supplied from the more remote plants at Great Falls and on the Madison River, will be augmented by the power generated at the Mystic Lake plant which has a 10,000-kw. capacity.

This plant, which is situated on the West Rosebud River, 45 miles south of Columbus, Mont., is operated under an effective head of 1,050 ft. A dam 25 ft. high impounds 20,000 acre-ft. of water, which is brought to the 2,800-ft. steel penstocks through a tunnel 1,000 ft. long and a 56-in. wood pipe 9,000 ft. in length. Plant equipment consists of two 7,500-hp. Pelton water wheels connected to two Westinghouse 6,250-kva. generators, and two Westinghouse 3-phase, 6,000-kva. transformers. A 51,000-volt transmission line has been erected to Red Lodge, a distance of 27 miles.

California Institute of Technology Conducts Strength Tests.—Strength tests to last approximately a year or more now are being conducted on different types and makes of suspension insulators (high strength) at the high-tension laboratory of the California Institute of Technology, Pasadena, Calif. Apparatus has been set up by which four different loadings are put on these insulators until a failure occurs. Both short-time and long-time load tests are made to test the ultimate strength of the units, and all units so loaded are given periodic electrical tests. This important work will have a bearing on the equipment to be used on the construction of the Southern California Edison Company's new Big Creek 220,000-volt line.

Faculty for Pacific Coast Truck School Is Announced

Definite plans for the Electric Truck School to be conducted under the auspices of the National Electric Light Association in San Francisco, June 8-13, are nearing completion. The faculty for the school has been partially determined upon and includes the following nationally known men: Charles A. Skinner, New York Edison Company; B. J. Martin, Commonwealth Edison Company; George E. Cole, Commercial Truck Company; S. A. Freeman, vice-president, Walker Vehicle Company; J. C. Boyers, sales manager, Ward Motor Vehicle Company; and G. A. Round, Vacuum Oil Company. Other prominent men interested in the development of the electric truck industry have signified their intention of being present during the duration of the school, which will be held just prior to the National Electric Light Association convention.

The curriculum of the school has been prepared and will include the following topics:

Charging Equipment.
Motors and Controls.
Maintenance and Repairs.
Fleet Operation.
Truck Lubrication.
Garage Management.
Salesmanship.

The school will be opened June 8 by Frank A. Leach, Jr., vice-president and general manager of the Pacific Gas and Electric Company, and president of the Pacific Coast Electrical Association. During the remainder of the week lectures will be given during the afternoons, the mornings being given over to the inspection of equipment displays and fleets in the San Francisco Bay region. This arrangement will permit those who desire to attend the Industrial Heating School, which will be held in the mornings from June 9-13.

The truck school will be held in the new general office building of the Pacific Gas and Electric Company. Enrollment in the course should be made through J. L. Farley, Pacific Gas and Electric Company, San Francisco.

Grays Harbor Company to Develop Power on Olympia Peninsula.—The Grays Harbor Railway & Light Company of Aberdeen, Wash., will develop hydroelectric projects on the Olympic peninsula, even if the city of Aberdeen decides to develop a similar project on the Wynooche River, according to E. N. Sanderson, president of the Federal Light & Power Company of New York, of which the Grays Harbor company is a subsidiary. The company has made surveys, Mr. Sanderson states, on the Wynooche, both forks of the Quinault and on the Queets and Hoh watersheds, and has filed on the Queets, Hoh and Quinault Rivers.

Contracts for Largest Turbines and Generators Signed

Contracts for hydraulic and generating units for the Rio Itapauhau plant of the Sao Paulo Tramway, Light & Power Company, Sao Paulo, Brazil, have been signed recently. The Pelton Water Wheel Company, San Francisco, will supply two 40,000-hp. impulse turbines and the International General Electric Company has been awarded the contract for the two 28,050-kw. horizontal generators. The hydraulic units will create a new world's record for capacity, the former record having been held by a Pelton 35,000-hp. wheel in the Big Creek No. 1 plant of the Southern California Edison Company. The generators will be the largest horizontal units ever made.

Sao Paulo is the center of Brazilian industry, which is made up of a diversified line of manufacturing. It is approximately 50 miles from the city of Santos, an Atlantic seaport on the southeastern coast of Brazil. The shipment of hydraulic equipment will aggregate 500 tons which will be transported by an all-water route to Santos, whence it will be hauled by rail and truck to the power-house site.

Each of the two turbines, operating under a 2,230-ft. head, will be direct-connected to a generator rated at 33,000 kva., 11,000 volts. The generator voltage will be stepped up to 88,000 volts for transmission to Sao Paulo and vicinity.

Mansfield Will Be Westinghouse Merchandising Center

In order to place the head offices of the merchandising department of the Westinghouse Electric & Manufacturing Company near the site where most of the articles handled by the department are produced, that department has been moved recently from New York to Mansfield, Ohio. In the future all of the activities of this branch of the Westinghouse company will be directed from Mansfield.

J. S. Tritle, formerly manager of the merchandising department, has become general manager. Mr. Tritle has moved his headquarters from New York to Mansfield, from where he will direct all merchandising activities. As the majority of the articles included in the merchandising department are produced at the Mansfield works, Mr. Tritle will have his headquarters in that city and the manufacturing, engineering and sales forces located at that point will report to him directly.

Heretofore the engineering and manufacturing operations have been supervised by officers located at East Pittsburgh, while the sales activities have been directed from the merchandising headquarters in New York. All engineering work will be conducted in Mansfield under the supervision of Mr. Tritle. Those engineers at East Pittsburgh who have been engaged on the products made in Mansfield will be moved to the Ohio plant.

Mountain States Company Enlarges Operations by Purchase

Enlargement of the scope of operations of the Mountain States Power Company, Albany, Ore., is made known through the recent announcement of the purchase of the Natrona Power Company, Casper, Wyo., (Journal of Electricity, May 1, 1925, p. 341), the municipal distribution system at Wheeler, Ore., the Sublimity Light & Power Company, Sublimity, Ore., and the Aumsville Light & Power Company, Aumsville, Ore.

The towns of Sublimity and Aumsville, Ore., are in Marion County not far distant from Stayton, the light and power business of which was purchased last year by the Mountain States company. The newly purchased properties will be tied in with Stayton by an 11,000-volt line. The town of Wheeler, Ore., on upper Tillamook Bay, will be served from the system of the Coast Power Company acquired recently by the Mountain States company.

Chain of Utilities Is Formed in Rocky Mountain Region

Another chain of light and power companies has been organized in the Rocky Mountain region, the formation of which has been announced by E. P. Bacon, vice-president and general manager of the Natrona Power Company at Casper, Wyo., until the recent absorption of that company by the Mountain States Power Company. The new company is known as the Midwest Public Service Company and already has been chartered to operate in Wyoming and South Dakota.

H. C. Chappell, formerly Mr. Bacon's assistant in the Natrona company, is associated with him in the new arrangement as general manager of the company. It is understood that Salt Lake City capital is behind the new organization which has assumed control of the Big Horn Utilities Company, Greybull, Wyo., the Western Utilities Company, Edgemont, S. D., and the Platte Valley Power Company, Valley, Neb.

Operating headquarters of the company will be maintained at Casper although plans contemplate the extension of activities to every state in the Rocky Mountain region as well as western Kansas and Nebraska.

Aberdeen Employs Skagit Engineer.—The city of Aberdeen, Wash., has retained C. F. Uhden, formerly engineer in charge of the Skagit River power construction for the city of Seattle, to make a survey of the Wynooche hydroelectric project, supplementary to the report made by S. C. Watkins, water superintendent. Mr. Uhden is expected to make a report in the near future to the mayor and city council of his findings, which will include additional data as to water volume from gages he has placed in the river, and also as to the amount of timber to be taken out and cost of logging. In the meantime, the state supervisor of hydraulics is still to report on the application of the city for water and power rights, which he took under consideration after a hearing a short time ago (Journal of Electricity, April 15, 1925, page 297).

Application Filed for Appropriation of Water from Feather River North Fork Tributaries—Application has been filed with the California Department of Public Works, Division of Water Rights, by Robert B. Muir, San Francisco, for permission to divert 175 sec.-ft. of water from Bucks Creek and Grizzly Creek tributary to the North Fork of the Feather River in Plumas County. The water is to be used for the generation of electric energy.

Westinghouse Company Organizes Acceptance Corporation

As an expansion of its service to electrical dealers and appliance manufacturers, the Westinghouse Electric & Manufacturing Company has announced the formation of the Westinghouse Acceptance Corporation, a $2,000,000 enterprise to assist buyers of Westinghouse products in the financing of time-payment sales of their apparatus. G. Brewer Griffin, recently manager of the Westinghouse automotive equipment department, will have active charge of the new company, as vice-president and general manager.

According to Mr. Griffin, the acceptance corporation in the main was formed to furnish a more complete low-cost, simplified service to those providing the sales outlets of Westinghouse apparatus. The purpose is to furnish financial service to dealers and manufacturers which will assure more rapid and profitable turnover of their capital involved in time-payment transactions and at the same time provide a cooperative service to expand the volume of the time-payment business of the dealers.

The head offices of the new corporation will be in the East End Trust Building, Pittsburgh.

California Displaced by New York in Electricity Generation

In the United States during 1924 more than 59,000,000,000 kw-hr. of electricity were generated by water power and fuel, according to recent reports from Washington. Statistics compiled show that New York led in the production of electricity by water power, having generated 19.84 per cent of the total, and California was second with 15.76 per cent. For the three years previous California had been first. Washington produced 7.08 per cent; Montana 5.69 per cent; South Carolina 4.35 per cent; Idaho 3.96 per cent; Michigan 3.78 per cent, and Iowa 3.48 per cent.

New York also led in the production of electricity by means of fuel, with 13.64 per cent of the total. Pennsylvania generated 12.88 per cent; Illinois 11.45 per cent; Ohio 9.39 per cent; California 6.20 per cent; Michigan 4.97 per cent; West Virginia 4.45 per cent; and Massachusetts 4.28 per cent.

Southern Delegates Attend Meeting.—The southern division was well represented at the quarterly meeting of the California Electragists recently held in Visalia, Calif. Among those present were: C. W. Jones, T. L. Hall and A. Hall, Pomona; S. F. Jones, Covina; Mr. and Mrs. J. F. Zweiner, San Diego; Frank McGinley, Wilmington; P. H. Needham, A. Hill, J. A. Lenzinger, and H. B. Woolsey, Beverly Hills; F. E. Elser and A. L. Spring, Los Angeles; J. J. Farley, Fullerton, and C. J. Geisbush, executive secretary.

Transformer Standards Booklet Revised.—Completely revised and brought up to date is the fourth edition of the "Transformer Standards of the Electric Power Club" which recently came from the press. This issue contains all of the new standards which have been adopted since the 1924 edition was circulated. Diagrams and tables support the text in setting forth usable information in an intelligible manner.

Annual Reports of Six Electric Utilities Are Presented to Stockholders

The annual reports of six utility companies engaged in the generation and distribution of electrical energy in the West have been published recently. Five of these reports deal exclusively with companies operating in the West, and the sixth is that of an operating company with large interests in the eleven Western states. The reports have been reviewed for the benefit of Journal of Electricity readers.

Southern California Edison Company

The annual report to the stockholders for the year 1924 has been published recently by the Southern California Edison Company, Los Angeles. It gives a comprehensive statement of the status of the company, and the facts are presented simply and clearly.

The gross earnings for the year 1924, according to the statement, amounted to $21,389,499.66 as compared with $20,211,160.20 for 1923. The net earnings, however, were $8,395,720.10 as compared with $11,324,688.98. The decline is accounted for by the great increase in operating costs due to the water shortage, the winter of 1923-24 holding the record for the lowest precipitation in California in forty years. This water shortage caused a curtailment of hydroelectric output and a coincident increase in demand from irrigation centers. The company was forced to put into service a number of small generating plants that had been abandoned and shut down for years and in addition had to purchase power extensively from other companies. This resulted in $11,314,296.58 being expended for operating expenses and maintenance as against $6,984,904.10 in 1923. At the same time the company distributed and sold 1,353,933,547 kw-hr., which amounted to 173,791,355 kw-hr., or 15 per cent more than in 1923, which had been the company's record year. The report states that while these excessive costs make an abnormal showing in operation for the year 1924 they will be absorbed over an average number of years, partially out of the contingency reserve for 1924 and the remainder from the reserve accumulation in subsequent years.

During the year $14,000,000 in bonds was marketed and the proceeds used to reimburse the treasury for capital expenditures. A total of $1,186,600 in bonds was retired during 1924. The number of stockholders increased by 4,467 for the year, making a total of 70,103. Since the inception of the customer-ownership plan of 1917, when the company had approximately 2,000 stockholders, 68,000 have been added. During that period $61,086,700 par value shares were sold, of which $7,755,400 par value shares were subscribed by employees. Stock sales amounted to $14,472,500, covering 39,360 shares of 7 per cent and 100,000 shares of 6 per cent preferred and 5,365 shares of common. For the year 1925 $10,000,000 7 per cent preferred stock is to be sold.

The principal items of capital expenditures in 1924 were:

Big Creek water power plants under construction	$ 8,926,264.43
Additions to Long Beach steam plant	8,769,794.48
Additions to 220,000-volt transmission system	1,637,752.80
Miscellaneous additions to generating plants	520,367.77
Transmission and telephone lines	834,559.82
Substations	2,422,273.88
Electric distribution system	4,139,155.58
General store, shop and test department, buildings and equipment	1,145,259.99
District offices, stores, garages and miscellaneous	1,005,992.99
Total	$29,401,421.74

The budget for new construction expenditures for the year 1925 is summarized as follows:

Water power development	$ 7,535,000
Steam power development, Long Beach steam plant	3,965,000
Miscellaneous additions to water power and steam plants	595,478
220,000-volt transmission lines, substations and right-of-way	1,500,000
Transmission lines and substations (60,000 volts and under)	1,077,000
Distribution lines and substations	8,750,000
Miscellaneous buildings, equipment, system betterments, subsidiary companies, etc.	1,577,522
Total	$25,000,000

The total output of the Edison system in 1924, including water power plants, steam plants and purchased power, was 1,687,888,206 kw-hr., as compared to 1,548,896,120 kw-hr. in 1923. The connected load in 1924 amounted to 1,003,485 hp. as against 899,950 hp. in 1923.

Due to the water shortage and consequent curtailment of hydroelectric output, the company deferred its new business activity during the greater part of 1924, but the report states that "the outlook for 1925 from the company's standpoint is unusually bright in the direction of adding new business and all reasonable demands for service will be promptly met."

Pacific Gas and Electric Company

An increase of 13 per cent in gross operating revenue for the year 1924 is reported to the stockholders of the Pacific Gas and Electric Company, through its president, W. E. Creed, in the nineteenth annual report recently issued, the total being $44,451,586 os compared with $30,321,535 for 1923. The principal factors contributing to this increase of $5,130,051 were: normal growth of a permanent character, measurable by the net addition of 51,816 customers, exclusive of those taken over in the acquisition of other properties: increase of 134,791,000 kw-hr., or 11.2 per cent in electric sales, and increase of 1,602,683,200 cu.ft., or 11.7 per cent in gas sales; the inclusion of earnings of acquired companies aggregating approximately $170,000 more than the corresponding figure of 1923; two increases in gas rates; increased use of electric energy for irrigation induced by the drought experienced in California in 1924; addition of about $140,000 to gross revenues due to one additional day's operations, 1924 being a leap year.

General and administrative expenses for the year were substantially the same as in 1923, but operating expenses increased by $5,222,810. The increase is attributed to the following causes: extraordinary expenses, temporary in character, of approximately $2,500,000 incurred chiefly in the operation of steam plants to supply the deficiency in output of hydroelectric plants due to drought conditions; increased cost of oil to the extent of $1,930,000; added expenses of $793,000 normally following the much larger volume of production and distribution in 1924 and of service to 53,582 additional customers. The ratio to gross earnings of all ordinary operating expenses, including maintenance, taxes, etc., but excluding temporary expenses occasioned by the drought, was 57.8 per cent in 1924 as against 60 per cent in 1923.

During the drought increased demands, particularly from agricultural sections, aggregated 134,791,000 kw-hr., or 11.2 per cent of the preceding year's electric sales. The report states that by extraordinary efforts the company was able to go through the critical period without curtailing deliveries of electric energy to any of its customers, without lowering service standards, without refusing any new business offered, and, by strictest economy and the deferment of expenditures not essential to the service or immediately necessary, without impairment of its financial position, notwithstanding the fact that no increase in rates was requested. Total net income from all sources amounted to $16,732,323, or $253,991 in excess of 1923, a relatively small increase in view of the greatly increased volume of new business and of the large amount of new capital invested during the year. The report points out that the correct view to take in this instance is that, now that the conditions which compelled a temporary increase of $2,500,000 in operating expenses have disappeared, the benefits to which the company is entitled from the additional business and capital investment merely were deferred, through unavoidable circumstances, and should be realized under present normal conditions.

The dividends on preferred stock amounted to $3,244,603 and on common stock $3,040,123. The report invites attention to the fact that the broadening market for its common and preferred stocks is reflected in constantly decreasing average holdings. In the ten and one-half years since the company initiated the customer-ownership policy the average number of shares owned by each preferred stockholder has decreased from 79.5 to 25.9 and that owned by each common stockholder from 162.3 to 39.6 The average amount of both classes of stock held by each of the 31,859 customer-owners as of Dec. 31, 1924, was 30.5 shares as compared with 130.9 shares on June 3, 1914. At the close of 1924, 15,621, or 53.3 per cent of the company's stockholders owned 10 shares or less and 95.7 per cent owned not to exceed 100 shares each. This is exclusive of stock being purchased on the installment plan by 2,549 employees.

The report states that the company ranks second in the United States in its hydroelectric output and fourth in the output of power generated in both hydroelectric and steam electric stations. It now operates twenty-seven hydroelectric plants with a combined capacity of 426,239 hp., and four steam electric generating plants with an installed capacity of 190,349 hp., the aggregate installed capacity of all plants being 616,588 hp.

The company developed during 1924 a service sales program formed on the basis of a definite continuous effort on the part of the entire organization to merit, win and hold the good will of the public. It consists of: appeal to

employees; appeal to consumers; cooperation with dealers and civic organizations; appeal to public; educational trips to company properties. The report touches upon the functions of the personnel department and the welfare work handled through the Pacific Service Employees Association, and closes with an expression of appreciation of the fine spirit of loyalty and cooperation which has characterized the company's organization throughout the year.

San Joaquin Light & Power Corporation

W. G. Kerckhoff, retiring president of the San Joaquin Light & Power Corporation, Fresno, Calif., in his report to the stockholders for the year 1924, at the outset directs attention to the fact that that year was without precedent in the history of electric utilities in California on account of the extreme drought in water supply available for hydroelectric plant operation. In spite of this condition, the company's customers were served throughout the year without any curtailment, due to the purchase of additional power from the Turlock Irrigation District and other sources and the practically continuous operation of the company's steam plants. The dry season resulted in a great increase in load largely from agricultural use, the pumping load increasing 51 per cent over that of the preceding year. The increased demand of agricultural consumers was met in full at an additional expense to the company of over a million dollars, but no increase in rates was charged.

The total output for the year 1924 was 573,821,266 kw-hr., an increase of 23½ per cent over 1923. Of this, 12 per cent or 70,718,008 kw-hr. was supplied to the southern part of California to help relieve the shortage there.

Gross operating revenues for the year amounted to $7,450,925, a gain of 8.01 per cent over $6,898,353 in 1923. Revenues from electric light and power increased 8.51 per cent during 1924, while the sale of energy of 464,294,799 kw-hr. supplied a demand 20 per cent greater than in 1923. Excluding the energy supplied to foreign companies, revenues from business on the company's own lines increased 10.73 per cent, while the sales of energy correspondingly gained 25 per cent as compared with 1923. As of Dec. 31, 1924, service was being supplied to 70,263 consumers of electricity, water and gas, of which 3,822 were added during the year. The number of consumers, current supplied and revenues have doubled within a period of less than five years.

The 1924 operating expenses totaled $4,320,945 as against $2,954,544, an increase of $1,366,401. This increase is accounted for largely in the extraordinary expense for fuel used in the operation of steam power plants and purchased power directly attributable to the drought. Heavy maintenance expenditures were necessary during the year to reconstruct older transmission and distribution lines. Aside from these items, the increased expense incurred in normal operation is proportionately less than would be expected from the increased volume of business served, according to the report. In spite of the heavy expenses, all bond interest charges and dividends were met in full, the surplus accumulated in past years being drawn upon for a part of the dividends. Stock and bonds sold early in 1924 produced funds sufficient to carry construction well along into 1925. Only necessary additional facilities to connect new business and maintain service were constructed during 1924, the capital expenditures for that period amounting to $2,349,538.67 as compared with $4,581,006.55 for 1923. The construction budget for 1925 calls for an expenditure of $3,000,000.

New stockholders to the number of 1,062 were added in 1924, and at the end of the year 11,502 preferred stockholders were customer-owners. More than 60 per cent of the company's stockholders are residents within the territory served and more than 95 per cent within California. Of the stockholders, 58 per cent own less than five shares and 60 per cent are in the wage-earning class.

The company's new ten-story office building in Fresno was completed and occupied in February, 1924.

The report announces the acquirement by the Western Power Corporation of New York of the control of the San Joaquin Light & Power Corporation and its subsidiaries, the Midland Counties Public Service Corporation, and the Fresno City Water Corporation, and states the company will continue under the same management and policies "in rendering the best possible service to the public and in the development of the natural resources of the territory for the benefit of its customers."

The California-Oregon Power Company

The annual report of The California Oregon Power Company for the year 1924 begins with a record of growth by setting forth a comparative statement of the annual gross and net earnings and operating and maintenance expense of the company from 1912 through 1924. An interesting comparison is afforded by the figures for 1912 and 1924 as follows:

	Value Physical Properties	Gross Revenue	Operating Maintenance Expense Taxes	Net Earnings	Kw-hr. Generated
1912	$ 4,189,325	$ 307,040	$ 137,663	$ 169,376	21,492,374
1924	15,415,091	1,699,764	698,888	1,000,875	175,778,058

The company has nine generating stations with a total capacity of 38,780 kw. During the year a very active program of construction was carried on, the total for capital betterments aggregating $3,662,475.08. Of this $2,601,020.50 was expended for the three major undertakings of the program, namely, the construction of the new East Side plant on Link River in Klamath Falls, completed and placed in operation Aug. 22, 1924; the construction of Copco No. 2, a second power plant on the Klamath River just below Copco No. 1 plant, which will be completed during 1925; and the construction of a 110,000-volt transmission line 77½ mi. long, extending from the plants at Copco to Delta, Calif., that was finished in November, 1924. The balance, $1,061,454.58, was expended in rebuilding older lines, many extensions to new consumers, and considerable enlargements of various substations and other similar structures necessary to take care of growing demands for power and other electrical service in the territory. The completion of Copco No. 2 plant will add 30,000 kw. generating capacity, or a total capacity of nearly 69,000 kw.

During the year 1924 the company received authority to issue $2,500,000 in 6 per cent bonds, $1,500,000 in 7 per cent twenty-year sinking fund debentures, and $1,000,000 preferred capital stock. The total face value of $5,000,000 was and is being used to finance the construction program already referred to. The company has adopted the customer-ownership policy, and its stockholders now number over 2,300 persons. All of the 7 per cent preferred stock authorized previous to the issue just mentioned has been sold, and nearly one-half of the last issue has been sold to customers of the company. This distribution was made solely through the efforts of the members of the organization. Sales were made for cash or under a partial-payment plan of $5 per share per month, interest being allowed on all partial payments. Dividends have been paid regularly upon the preferred capital stock since its issuance.

From the standpoint of business development, the year 1924 has been one of the most successful that the company has had, increase in revenue from business within the territory amounting to 17 per cent. The aggregate increase in connected load, exclusive of wholesale deliveries, has amounted to 8,450 kw. Of this, 4,182 kw. represent added domestic and lighting load, the balance increase in power load. The total number of electric consumers has increased from 13,395 to 14,521. Over 316 domestic electric ranges were added to the lines during the year, bringing the total number up to 1,672. Cooking schools, cooking demonstrations and the publication of two range manuals helped stimulate range sales. Effort has been made to stimulate the use of electric power for pumping. Considerable time has been spent for that purpose, and a manual descriptive of pumping equipment and giving the cost of operation under various conditions has been published. The report states that the outlook for business growth for the year 1925 is encouraging.

Much stress is laid upon the personnel of the company's organization, and the statement is made that "the management is convinced that one of the important assets of the company is the splendid morale of the organization and the loyal support rendered by members of the organization." As a part of the personnel record, pictures are being taken of everyone in the organization. Pictures of some of the men at Copco, typical of the organization, are included in the report, and the regret is expressed that there is not space for all. The report is made particularly interesting by the number of fine photographs of the company's different projects.

Los Angeles Gas & Electric Corporation

The annual report and year book for 1924 recently issued to the stockholders of the Los Angeles Gas & Electric Corporation states that the corporation has experienced a healthy growth for the year, that everything points to a continuance of that growth, and that the outlook is most promising.

Gross receipts for the year are given as $16,056,722, total operating expenses

and taxes $9,446,604, and net operating income $6,610,117. Dividends paid on both preferred and common stock amounted to $1,417,863. Net expenditures for additions and betterments to plants and equipment during 1924 were as follows:

Gas works	$ 1,760,390.46
Electric generating stations	2,523,278.79
Gas distributing system	3,774,547.29
Electric distributing system	3,333,076.93
General betterments	2,590,289.65
Land purchased	1,712,219.93
Total	$15,693,803.05

Improvements planned for the coming year call for an expenditure of approximately $13,000,000.

An increase in the preferred stock of the company from $10,000,000 to $30,000,000 and in the common stock from $20,000,000 to $30,000,000 was authorized in 1924.

The Los Angeles Gas & Electric Corporation is a staunch advocate of customer-ownership, and on the first of the year (1925) there were 142,857 shares of preferred stock outstanding or being sold on installments. In addition to the sale of stock, bonds amounting to $8,000,000 were sold in February and to $6,000,000 in November.

The output of electricity in 1924 was 158,805,776 kw-hr., exclusive of electric current supplied to relieve the shortage on other systems. The figure given is an increase of 24.96 per cent over the 1923 output, which amounted to 127,357,201 kw-hr. The number of electric meters as of Jan. 1, 1925, was 111,075. The report states that the growth of the corporation's service is well illustrated by the fact that the number of gas meters and gas output practically doubled in the last four years, while the number of electric meters and the electric output doubled in the last three years; the gross earnings also doubled in the last four years.

The report pays particular attention to employees activities, which include the employees' insurance fund, Old Guard and band, and baseball, basket ball and bowling teams.

Standard Gas & Electric Company

The Standard Gas & Electric Company, operating company for the Byllesby properties, in the twelve months ended Dec. 31, 1924, had the most successful year in its history, according to the statement of its president, John J. O'Brien, in the annual report to the stockholders recently issued. For that period gross earnings amounted to $6,098,532, an increase of 17.35 per cent over the preceding year. The balance available for common stock dividends was equal to $6.61 a share on the 302,693 shares outstanding Dec. 31, 1924, there having been an increase of 90,693 shares during the year due to the conversion of debenture bonds. Total holders of all classes of the company's stock were approximately 20,600 at the close of 1924, an increase of 7,900 during the year.

The operated utility companies, as a whole, enjoyed good growth in business and earnings. Combined gross earnings of these companies increased 9.07 per cent, and net earnings increased 13.6 per cent. The total number of customers increased from 691,041 to 740,964, and total electric connected load increased from 1,101,998 to 1,241,787 kw. Electric energy output for the year amounted to 1,469,377,905 kw-hr. The company has increased substantially its holdings in Northern States Power Company and now owns the controlling interest in that company.

Operated utility companies continued the successful development of the customer-ownership policy inaugurated in 1915, and at the end of the year had approximately 64,000 shareholders, a net gain of about 14,000.

The total amount expended in 1924 for construction of new plants, additions, improvements, transmission and distributing equipment was $30,939,715 and $31,388,262 in 1923. The construction budget for 1925 has been set at $22,948,000, which will be devoted largely to transmission and distributing equipment needed to reach and serve additional customers. New electric generating capacity completed and put into service in 1924 amounted to 179,925 hp., of which 31,225 hp. was hydroelectric and 148,700 was steam. The most important water-power development finished was the 27,000-hp. unit of the El Dorado project of the Western States Gas & Electric Company, Stockton, which went into service late in January, 1924.

The report states that the Byllesby Engineering & Management Corporation had a very satisfactory year and its earnings were correspondingly good, and concludes with the statement that the outlook for the continued growth and prosperity of the Standard company is most encouraging.

Report to Stockholders Issued by General Electric Company

The thirty-third annual report of the General Electric Company, Schenectady, N. Y., to its stockholders recently was issued for the year 1924. The report shows that orders received in 1924 amounted to $283,107,697, a decrease of 7 per cent from those received in 1923, which amounted to $304,199,746. Unfilled orders at the end of 1924 aggregated $68,958,000 as against $87,112,000 at the end of 1923. Net sales billed in 1924 totaled $299,251,869 and in 1923 $271,309,695. Cost of sales billed, including operating, maintenance and depreciation charges, reserves and provision for all taxes, amounted to $264,909,538 as against $241,653,949 in 1923, leaving a net income from sales in 1924 of $34,342,331 as compared to $29,655,747 the previous year. Deductions for interest, discount and additions to general reserve left available for dividends $39,235,548 in 1924; in 1923 the figure was $33,525,118. Dividends of 6 per cent on special stock, amounting to $1,195,405, and 8 per cent on common stock, amounting to $14,404,980, were declared in 1924. The net book value of the manufacturing plants of the company is given as of Dec. 31, 1924, as $55,769,645. The number of stockholders of both classes as of Dec. 3, 1924, was 37,716, of whom 45 per cent were women.

The report explains the disposal of all of the General Electric Company's holdings of the capital stock of the Electric Bond & Share Company by means of the organization of a new corporation. (Journal of Electricity, Jan. 15, 1925, p. 72.)

The International General Electric Company, Inc., New York, which conducts the export business of the General Electric Company, has issued its sixth annual report to the stockholders covering the year 1924. During this period a reduced volume of business was secured, owing to the continuation of unfavorable conditions in foreign countries prevalent since late in 1920.

Orders booked during 1924 amounted to $17,590,000 as compared with $21,743,000 in 1923, the decrease due in part to the elimination of orders from Canada, business with that country having been carried on since early in 1924 by the General Electric Company, which acquired a majority of the common stock of the Canadian General Electric Company, Ltd. Sales billed during the year aggregated $22,590,108 as compared with $22,371,526 in 1923, this result being due to the completion of orders carried over from the previous year. The 1924 total net income amounted to $2,512,816 as against $2,526,251 for 1923.

The statement reports strong competition from British and continental manufacturers, resulting in a reduction of profit from selling operations from $967,506 for 1923 to $690,371 for 1924. It is anticipated that keen competition will continue, but general business conditions abroad are improving, and "it is felt that orders booked in 1925 will be substantially in excess of those of 1924."

Extensions Are Made to Pueblo Street-Lighting System

Extension of the street-lighting system in Pueblo, Colo., has been carried to such an extent that at the present time there are ornamental street lights on over thirty-seven miles of city streets. During the past five years nearly one thousand ornamental standards have been erected for street lighting purposes. Service is furnished by the Southern Colorado Power Company.

In the commercial district of the city five-light Corinthian columns are used. Four standards are placed 90 ft. apart on each side of the street in the downtown blocks. In the residential part of the city two types of posts are used. On streets with center parkways five-light posts of the Union Metal Company's make are installed in the center of the street intersections on concrete bases. Single-light standards using Nova-Lux heads with prismatic glassware are installed on the other residential streets.

Five-light posts with concrete bases are installed on Pueblo streets having center parking.

Washington Water Power Company Cuts in 110-kv. Line

The new Long Lake-Stratford 110-kv. transmission line of The Washington Water Power Company recently was cut into service. Work on this line has been under way since early last fall. Previous to cutting the line into service it was given a series of preliminary tests. The results of these tests were satisfactory in every way, according to B. M. Merrill, superintendent of light and power.

This 90-mile section is part of the line which connects the Long Lake hydroelectric plant with Taunton on the Milwaukee railroad. The 20-mile stretch of older line from Stratford to Neppel has been newly rebuilt to operate at 110 kv. Another section, 25 miles in length, completes the transmission system from the power plant to the point of delivery to the railroad system.

This new line is intended to provide duplicate service to the railroad as well as to furnish additional power to the Palouse and Big Bend districts. At Lind, on the Milwaukee road, a bank of 6,000-kw. transformers has been replaced with a 10,000-kw. bank to meet the increasing demand for the above-mentioned districts.

In the city of Spokane considerable work is being done to enlarge the capacity of the distribution system. Two 13,000-volt tie-lines have been completed between the new East Side substation and the Post Street substation. One of the two 60,000-volt transmission lines connecting the Post Falls generating plant with the Twenty-ninth Avenue substation has been looped through the new East Side substation. This will serve to make the transmission network more complete.

Work on the East Side substation has been under way for several months and is progressing favorably.

Kitchen Lighting Campaign Being Conducted in San Diego

As the result of six weeks intensive sales work 3,500 homes in San Diego County, Calif., have contracted for the installation of daylight kitchen lighting units. The present campaign, being conducted by the San Diego Consolidated Gas & Electric Company, at its inception was scheduled to continue for eight weeks.

During the first six weeks of the drive 20,000 calls were made by the salesmen of the company. According to G. H. P. Dellmann, lighting sales engineer of the company, under whose supervision the campaign is being conducted, over 15 per cent of the wired homes in San Diego will be equipped with the unit when the campaign is closed.

Work of many months in the preparation of the campaign is bringing the results that were hoped for, according to Mr. Dellmann. In anticipation of the campaign, billboard advertising was started early last year. To prepare the field for the broadsides which followed, the billboards drew attention to the lighting of the average kitchen.

A carefully worked out broadside was prepared, and as the sales force was about to start out upon its campaign in a district the broadside has been sent out so as to reach each home three to five days ahead of the salesmen.

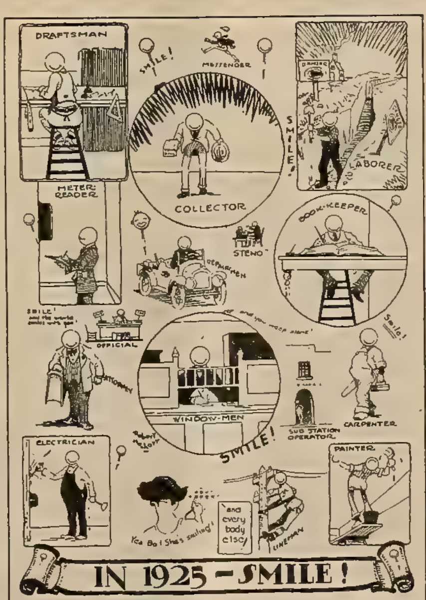
Selection and training of the sales force were given particular care by Mr. Dellmann. Classes for the salesmen were held at night, and each salesman was required to report in person each day to the central office. Good results have been obtained by the San Diego company from the "double cards," better than two per cent of the cards bringing in requests for the units after a salesman has left them.

Employees Home Lighting Contest Held by Pacific Company

Supplementing the Employees Home Lighting Contest sponsored by the N.E.L.A., the Pacific Power & Light Company, Portland, just completed such a contest for its employees, exclusive of officials, department heads and district managers. The rules of the contest, as well as the routine required of contestants, were substantially the same as those of the international contest for school children.

From the excluded employees were chosen seven judges, who picked the following winners from seventy entries: First prize, $100, W. L. Parkhurst, chief clerk, The Dalles, Ore.; second prize, $50, R. W. Hopper, extension clerk, Walla Walla, Wash.; third prize, $25, Marian Clark, purchasing department, Portland. The winning essay and primer will be submitted as a contestant in the employees' national contest.

"Engineering Data from Aerial Views."—This is the title of a booklet recently issued by Brock & Weymouth, Inc., Engineers, 1607-1609 Walnut St., Philadelphia. It outlines briefly the firm's specialty, the making of accurate topographic maps from aerial photographs, to be used as the bases for scientific study of engineering projects and is well illustrated with views of the camera, planes and other equipment used, as well as of aerial photographs, contoured plates, and an aero-topographic map made by the Brock process. F. E. Weymouth, president of the company, was for a number of years chief engineer of the U. S. Reclamation Service.



The L.A. Gas Monthly, published by the Los Angeles Gas & Electric Corporation, is a strong believer in the fact "that Faith Moves Mountains—Smiles Move Men," and advertises the fact with a full-page cartoon, which is here reproduced.

Changes in Tacoma Distribution System Contemplated

An ordinance calling for the expenditure of $95,000 for making changes and additions to the distributing system of the city light plant in Tacoma, Wash., designed to fit in with the Cushman power development, has been introduced in the city council. Besides making extensive changes in the distribution system, the ordinance also calls for the purchase of a synchronous condenser to be installed at the Nisqually substation at South Twenty-fifth and C Streets.

In altering the city distribution system of the light department, account is being taken of the fact that power from the Cushman plant will come in at 110,000 volts, whereas the La Grande plant is sending in power now at 60,000 volts. The first stepdown in the future system will be to 50,000 volts, and lines will carry current to district automatic substations at this voltage. The district substations, of which three will be built this year, will step the current down to 13,000 volts. The entire cost of the new distribution features will be actually about $150,000.

Gem Irrigation District Plant Under Construction

Work on the 10,000-kva. power plant, being constructed for the Gem Irrigation District by the U. S. Reclamation Service at the Black Canyon Dam on the Payette River near Emmett, Ida., is progressing. Orders have been placed for two 6,000-hp. S. Morgan Smith vertical turbines direct connected to two 5,000-kva., Allis-Chalmers generators with direct connected exciters. The power house foundation and draft tube outlets have been completed.

Power from this plant will be transmitted at 66,000 volts over the lines of the Idaho Power Company to the Gem Irrigation District, which has contracted to pay the U. S. Reclamation Service the cost of operating the plant plus five per cent interest on the cost of the power plant only, plus an amount for depreciation to be estimated by the Reclamation Service. It is expected that the plant will be completed in time for the 1926 irrigation season.

Corona Discharge Mechanism and Characteristics Discussed

The mechanism and characteristics of the corona discharge as revealed through several methods of study are discussed ably in Bulletin No. 19 of the Engineering Experiment Station at Purdue University. To some extent the various investigations have been treated as separate units, but the results are interrelated, and each carries its share toward the drawing of the final conclusions.

Some of the work described in this bulletin previously has been published in the form of papers before the American Institute of Electrical Engineers and the Academy of Science. Part of the work mentioned is incomplete. However, it has become so closely related to the study of nitrogen fixation that it is to be continued under that head.

The text is well handled and organized in a very readable and understandable manner. The publication comprises 112 pages, 98 illustrations of apparatus and spectra and 7 tables.

To Hold Hearing on Washington Company's Rates June 15

Hearing in the complaint initiated by the city of Walla, Walla, Wash., against the Pacific Power & Light Company of Portland, involving the rates, valuations, rules and regulations of the company's operations throughout the southern portion of the state of Washington, has been set for June 15 at Walla Walla. The inquiry covers all the company's operations throughout the Yakima and Walla Walla Valley, including the cities, towns and rural districts.

Original complaint was field by the city of Walla Walla last May. The state followed with formal complaint in July, and the city filed an amended complaint in December. The city claimed exorbitant rates were based on excessive valuations, and contended that there were a number of generating stations no longer used or needed, which should be stricken from the valuations entirely. The hearing will be before all three heads of the Department of Public Works.

California Electrical Bureau Advisory Board Meets

Topics relating to the management of the California Electrical Bureau were discussed at a meeting of the advisory board of the organization, held at the Palace Hotel, San Francisco, April 24. R. E. Fisher, chairman of the committee, presided.

The board decided to apply for membership in the California State Association of Electrical Inspectors. The secretary reported that negotiations for four additional electrical homes had been completed since the last meeting, the total for the year now being one home already completed and under inspection and eleven more under way. It was reported that negotiations were under way with the N.E.L.A. to receive permission to make an exhibit at the forthcoming national convention in San Francisco, June 15-19.

C. T. Hutchinson, chairman of the finance committee, reported that subscriptions to the campaign fund for 1925 were within about 3 per cent of the amount subscribed in 1924 and that in all probability the 1924 subscriptions would be equaled in 1925. The finance committee was instructed to develop additional prospects for financial support to the Bureau, as it was pointed out that too small a proportion of the industry was supporting the movement.

A committee headed by W. S. Berry reported the results of its labors in preparing specifications for the proposed Red Seal plan. After an extended discussion the plan submitted by Mr. Berry, with minor alterations, was adopted for submission to the Society for Electrical Development for its approval before being formally put into effect.

At the afternoon session Clark Baker presented an interesting series of charts visualizing the possibilities of the Bureau for extending its work and usefulness. In view of the larger responsibilities that had been placed upon the finance committee, L. E. Clark, Ross Hartley and the assistant secretary from southern California and C. D. Slaughter and Clark Baker from northern California, were added to the committee in order to assist in raising the additional funds required for the extension of the Bureau's activities.

A report was rendered by the Bureau secretary on the activities of June Bride Week; a sample of a three-colored poster was adopted as submitted. Every branch of the industry had been advised of the June Bride campaign and their assistance solicited in making a thorough success of this effort.

Mr. Berry presented a report covering an analytical study that he had made in order to ascertain a rational basis for the apportionment of the operating expenses of the Bureau among the different branches of the industry. His conclusions were that central stations should contribute not less than 70 per cent of the funds necessary, the balance to be provided by the jobbers, manufacturers and other branches of the industry. The matter was referred to the finance committee for consideration.

Among those present at the meeting were R. E. Fisher, W. S. Berry, C. L. Chamblin, H. H. Courtright, F. E. Elser, W. L. Frost, Charles Listenwalter, F. H. Woodward, W. F. Price, Clark Baker, Victor Lemoge, C. C. Hillis, Garnett Young, C. T. Hutchinson, C. E. Wiggin, C. E. Heise and P. H. Booth.

Second Arizona Meter School Is Gratifying Success

A special class in metering was held at the University of Arizona, Tucson, Ariz., April 2-4, under the direction of Prof. Paul Cloke. The session was opened with an address of welcome by Dr. Butler, dean of the Engineering Schools, who set forth the interest of the university in promoting the development of metering to a high standard.

Most of the Arizona power companies' representatives who were in attendance are shown in the accompanying photograph. These men were much impressed by the benefits derived from such a gathering and were loud in their praise of both the Pacific Coast Electrical Association and the university for their efforts in promoting the meetings.

The growth of the meter school from four members outside of Tucson in 1924 to twenty-five in 1925 is a good indication of the support and faith which the widely separated power companies of Arizona have in cooperation and standardization of metering methods.

Disk-Type Thermostat Used in Westinghouse Curling Iron

The principle of the disk-type thermostat has been applied with much success in the Westinghouse automatic curling iron, according to the Westinghouse Electric & Manufacturing Company. The iron may be used on either a.c. or d.c. circuits, and the thermostat as installed in it maintains it at constant temperature.

The construction of the disk-type thermostat is decidedly simple. There are three contact buttons, mounted on the bi-metal disk. Each of these buttons is of sufficient size to give two separate breaks. They are rolled silver plated, similar to the contacts which are mounted on a base. With these six breaks, and depending on the size of the thermostat, it is not a difficult matter to break 1,000 watts d.c. with the smaller size thermostat and as high as 3,500 watts d.c. with the larger size. This, of course, is done without the use of an external relay, and the thermostat is put in direct series with the load, doing away with the necessity of an auxiliary circuit. It is estimated that the time of the actual operation of the thermostat is approximately .00016 seconds. The speed at which the contacts move approximates that of a bullet traveling from the muzzle of a high-powered rifle. With such a speed, there can be no doubt about the positive action of the contact.

Slow-moving thermostats have been in use for years, and there are many patents in existence covering them and their various modifications. It was not until 1923, however, that a basic patent was issued covering a quick-make and quick-break thermostat in which the bi-metal itself was the quick-moving part without the use of levers, springs, and similar devices. This patent covers, among other controls, a disk-type thermostat which does away with the necessity of complications so common to ordinary thermostats and permits the thermostat itself to break, without the use of a relay, currents as high as 3,500 watts, either a.c. or d.c. John A. Spencer, of the Spencer Thermostat Company, Cambridge, Mass., was the first to work along lines of thought which ultimately led to the disk-type thermostat.

Part of the group of Southwestern electrical men who attended the meter school recently held at the University of Arizona, Tucson

News of the Electragists

California Electragists Have Successful Quarterly Meeting at Visalia

Seventy-five members of the California Electragists gathered at the Hotel Johnson, Visalia, May 9, on the occasion of the quarterly meeting of the association. The executive committee met at 10:30 a.m., and the general open meeting was held at 1:30 in the afternoon.

The meeting was presided over by Victor Lemoge of San Francisco, president of the association. One hundred signed applications from members of the southern division were presented and accepted.

Clyde Chamblin, of the California Electrical Construction Company of San Francisco, gave a report of the meetings of the executive committee of the Association of Electragists, International, and of the board of directors of The Society for Electrical Development, that he recently attended in New York City. He told of a meeting with the electrical contractors of Detroit, Mich., which had been arranged by Ernest McCleary, executive committeeman from the Great Lakes district. In discussing the meeting of the executive committee of the A. E. I., Mr. Chamblin spoke of the election of James A. Fowler to succeed James R. Strong as president of the association and of some of the characteristics of the two men. He stated that the association modified its stand on the all-metal standard and would devote its efforts to its adoption in congested sections and certain types of buildings. Mr. Chamblin mentioned the employees' insurance plan of the association. He also discussed the work of the code and cost data committees and some of the other activities of the international association.

In speaking of the meeting of the board of directors of The Society for Electrical Development, Mr. Chamblin pointed out the fact that that organization was the clearing house for all branches of the industry. He stated its place in national activities corresponded to that of the California Electrical Bureau in California.

Victor W. Hartley, executive secretary of the California Electrical Bureau, discussed some of the plans of the bureau for this year's "electrical wedding-gift drive." He suggested that details of the plan be secured from pages 332 and 333 of the May 1 issue of the Journal of Electricity. In addition to the information contained in the Journal he stated that moving picture slides could be obtained for use during the campaign.

Walter F. Price, executive secretary of the northern division of the California Electragists, told of the progress on the Red Seal House-Wiring Plan. He stated that it was an effort to secure adequate wiring for all homes. The California Electrical Bureau will be the agency of The Society for Electrical Development in California in conducting the Red Seal Plan and will be under a license from that body. A set of specifications will establish a minimum standard which must be met before a house can be classed as a Red Seal home. A large supply of these specifications will be printed and distributed to the contractors. The present plan provides that a copy of these specifications be submitted with each proposal made by a contractor and that he urge the owner to have a Red Seal job installed. Mr. Price stated a number of power companies and manufacturers already have outlined their plans for cooperating with the movement, and a great deal of advertising will be done to bring the plan before the public.

Felix Butte, of the Butte Electric Equipment Company of San Francisco, told why he is a member of the California Electragists. He stated that the leaders and successful contractors are members of their trade associations. He pointed out the value of the information and knowledge obtained from the material received from the national association. The value of the contact with fellow members and others in the industry, especially at conventions and similar gatherings, was stressed particularly. Mr. Butte emphasized the value of collective action in local, state, and national activities. He read some statistics prepared by insurance companies that showed that out of 100 men at twenty-five years of age, only four were well to do and one was rich at the age of 65. He expressed the belief that to be successful at sixty-five years of age, it was necessary to band together, trust one another and hold association membership above everything else.

C. J. Geisbush, executive secretary of the southern division of the California Electragists, told the members of the activities in the southern division. He stated that the electragist movement had made the contractors realize the fact that they have a common problem which can be solved only by organization and meetings. He said that an analysis of the electrical contractors in the state had shown that 51 per cent of those who entered the business failed within the first year; and that only eight in 100 remained in the business ten years. He told of some of the steps leading up to the affiliation of the contractors of the southern division with those of the northern into a unified body of California Electragists. Mr. Geisbush stated that after an analysis of their problems they had decided to take up the subject of estimating as their first big problem to be considered. He described the method that is being used by them in making a detailed study of this problem and the method used in presenting this to the contractors.

Just previous to closing the afternoon session, the members stood in silent tribute to the memory of Jacob Senner, Electric Equipment Company, Lodi, Calif., who died May 6 as a result of injuries received in an accident.

Contractors were present from San Diego to San Francisco. Fourteen motored from southern California to attend this meeting. Nineteen from San Francisco made the trip in a special Pullman.

Pacific Coast Electrical Association

Plans for Conduct of N. E. L. A. Convention Are Nearing Completion

General plans, together with the reports of various committee chairmen, were discussed at a meeting of the N.E.L.A. general convention committee held in San Francisco on the evening of May 5. Under the direction of F. A. Leach, Jr., vice-chairman of the committee, plans for the reception of guests and general conduct of the convention were presented and approved.

E. O. Shreve, chairman of the budget committee, submitted a report to the effect that allocation of convention expenses to various branches of the industry had been arranged and that collections of funds were in process. C. E. Heise, chairman of the hotel committee, reported that registration was proceeding at a satisfactory rate and approximately 1,000 reservations, principally from points east of the Rocky Mountains, had been made.

D. E. Harris, reporting for T. E. Bibbins, chairman of the reception committee, stated that delegations representing the committee would meet all incoming trains at points some distance from San Francisco in order to extend proper courtesy to visiting delegates, and that flowers for the ladies and baskets of fruit would be distributed at hotel rooms. Members of this committee will be instructed to wear white hats with blue ribbons bearing the insignia of the N.E.L.A. in order that they may be distinguished easily. A joint meeting between Mr. Bibbins' committee, the transportation committee and the hotel committee is to be held in order that proper co-ordination in the inter-relationship of these committees may be effected.

R. E. Fisher, chairman of the entertainment committee, submitted a carefully arranged chart showing the nature of the entertainment that will be provided during the entire convention week.

For the Saturday and Sunday before the opening of the convention the golf committee has made arrangements to permit visiting delegates, arriving ahead of schedule, to play on these days. On Monday a luncheon is scheduled to be given by the San Francisco Electrical Development League. W. E. Creed will act as chairman of this luncheon, and a series of short talks from prominent visiting delegates is to be arranged. The president's reception, which will be held at the Fairmont Hotel Monday night, will take the usual form of affairs of this nature. Two orchestras will be provided, one for incidental music and the other for dancing at the pleasure of the guests. Tuesday evening informal dinner dances will be arranged at the various hotels; incidental entertainment will be furnished by professional entertainers who will rotate among the various hotels. Wednesday evening the public policy meeting will be held at the Auditorium. Thursday evening will be the "Gala Night," when special entertainment of an unusual nature will be provided by Joseph Thompson, who has charge of this evening's program. Friday afternoon by special arrangement with the Key System Transit Company a special excursion around San Francisco Bay will be provided by means of one of the Key System's electrically propelled ferry boats. For Saturday informal golf games and a special trip to the top of Mt. Tamapais have been arranged. For the ladies preparations for special entertainment are under way, including an automobile ride through Golden Gate Park, a visit to the Japanese Tea Garden and the Cliff House. On Thursday trips to outside points of interest, including Stanford University, the East Bay District and neighboring power plants, will be provided after the formal sessions of the convention are over.

F. S. Myrtle, reporting for the publicity committee, stated that plans for the functioning of his committee were well under day, arrangements having been made to digest the convention papers in order to furnish abstracts to the newspapers. Photographs and biographical data on prominent delegates will be supplied to San Francisco newspapers.

M. W. Scanlon, reporting for the advertising committee, submitted a photograph of the final design for the convention poster, which was approved. Orders have been placed for the posters and for stickers to be used on letters for advertising the convention. Negotiations are under way for flood-lighting the new building of the Pacific Gas and Electric Company, the Standard Oil Building, The Pacific Telephone & Telegraph Company Building, and possibly the Auditorium. Arrangements have been made for the display of flags on Market Street, these flags including the United States flag, Smiles Banner, and other banners carrying the insignia of the N.E.L.A.

J. B. Black, reporting for the information committee, stated that headquarters of this committee would be maintained at the Auditorium and that the regular operatives of the Foster Information Service would be used to furnish general information, supplemented by special information concerning all of the activities of the convention.

P. M. Downing, reporting for the properties committee, stated that arrangements had been made to provide suitable booths at the Exposition Auditorium for registration, ticket validation and Pullman reservation service, together with full telephone equipment.

Further discussion brought out the fact that, while there would be no exhibits of machinery or equipment, arrangements would be made to display a model street-lighting exhibit. The California Electrical Bureau will display a special window-lighting exhibit, and the University of California will present its portable home-lighting exhibit at suitable points in the Auditorium.

R. M. Alvord, reporting for the general transportation committee, stated that arrangements had been made by which a representative of the railroads would be in attendance at the Auditorium in order to permit validation of tickets at that point.

W. G. Vincent, reporting for the local transportation committee, stated that arrangements were under way to provide proper taxicab service at railroad terminals and also at the Auditorium.

J. F. Pollard, reporting for the registration committee, precipitated a general discussion as to the advisability of opening registration booths on the Sunday before the convention. It was decided that it would be advisable to permit registration at the Auditorium on Sunday, June 14, between the hours of 10 a.m. and 4 p.m.

COMING PACIFIC COAST ELECTRICAL ASSOCIATION MEETINGS

Electric Truck School—
Pacific Gas and Electric Company Building, San Francisco
June 8-13, 1925

Industrial Electric Heating School—
Pacific Gas and Electric Company Building, San Francisco
June 9-13, 1925

Pacific Coast Electrical Association—
Annual Meeting—San Francisco, Calif.
June 15, 1925

Hold Industrial Heating School in San Francisco June 9-13

Definite assignments of topics to be covered during the Industrial Electric Heating School to be conducted by the Pacific Coast Electrical Association in San Francisco June 9-13, have been made by the committee in charge. The school is to be conducted under the supervision of the Westinghouse Electric & Manufacturing Company, and all classes will be held in the new building of the Pacific Gas and Electric Company.

The subjects that have been given to the different instructors are as follows: "Fundamentals of Electric Industrial Heating" and "Methods of Securing Electric Industrial Heating Load for Central Stations," by T. A. Reid, Westinghouse Electric & Manufacturing Company; "Steel Melting," "Brass Melting" and "Heat Treating," by E. A. Wilcox, manufacturers' representative; "Industrial Electric Air Heating," by W. W. Hicks, manufacturer. Although "Welding" will be covered by some competent authority, no definite assignment has been made.

The school will be held during the morning hours of the week, and the afternoons will be left open for inspection trips to installations and manufacturers' displays of equipment. This arrangement will permit those who desire to attend the course on electric trucks that will be given by the electric truck school committee of the National Electric Light Association on the afternoons starting June 8 and concluding on June 13. Both schools will be held in the Pacific Gas and Electric Company's new building.

Enrollment in the course should be made through J. L. Farley, Pacific Gas and Electric Company, San Francisco.

Book Reviews

TELEPHONE CIRCUIT DIAGRAMS

By JOHN M. HEATH. 279 pages, 7 x 4½ in., $2.50. McGraw-Hill Book Company, Inc., New York.

In examining this volume one gains the impression that the subject matter must have been presented originally in a series of blackboard talks which have been reduced to writing and brought out in book form.

In the earlier portions of the book this leads to a rather long-drawn-out series of drawings and explanations which are somewhat out of proportion to the circuit variations shown but which no doubt were justified for the conditions under which they were presented originally.

However, the author defines his object as an attempt to present a set of circuit diagrams which will serve to illustrate the principles of a telephone system. Within this province he has developed a series of drawings and descriptions ranging from the most elementary magneto telephone to instrument and switchboard circuits typical of American common-battery telephone practice. The present edition contains several inaccuracies which no doubt will be corrected in a later edition.

The first 110 pages are devoted to local-battery magneto telephones, starting with the fundamental talking circuits and leading up to individual and party-line ringing systems and the associated switchboard cord circuits used for connections between lines. The balance of the book is devoted to manual common-battery systems, showing the fundamental circuit arrangements used by the Western Electric, Stromberg-Carlson, Kellogg, and Dean Telephone Manufacturing Companies, together with typical switchboard line, cord, and trunk circuits.

As the author himself states in the introduction, "up-to-the-minute telephone practice never can be obtained from books; books embody principles, while the latest practice always must be obtained from the engineers and manufacturers of the industry itself."

The prospective purchaser therefore should not expect that all his trouble-finding thereby will be made easy, but the beginner no doubt will find it of considerable value in studying the principles of manual telephony while the experienced man may find it useful as a reference.

The size, being the same as that of numerous handbooks and specifications in use in the telephone industry, is very convenient for carrying and should prove a distinct advantage.

—A. E. B.

Meetings

Tentative Program for N.E.L.A. Convention Announced

A tentative program covering the main events of the annual convention of the National Electric Light Association to be held in San Francisco June 15-19, has been prepared. The tentative program is as follows:

Sunday, June 14

Registration 10 a.m. to 4 p.m.

Monday, June 15

Registration, morning and afternoon.
Luncheon, San Francisco Electrical Development League.
Pacific Coast Electrical Association Convention, afternoon.
Executive Committee meetings of National Accounting, Commercial, Public Relations and Technical Sections, afternoon.
President's reception, evening.

Tuesday, June 16

Registration, morning and afternoon.
First general N.E.L.A. session, morning.
First sessions National Accounting, Commercial, Public Relations and Technical Sections, afternoon.

Wednesday, June 17

Registration, morning and afternoon.
Second general N.E.L.A. session, morning.
Second sessions National Accounting, Commercial, Public Relations and Technical Sections, afternoon.
Public Policy Committee meeting, evening.

Thursday, June 18

Registration, morning and afternoon.
Third general N.E.L.A. session, morning.
Third sessions National Commercial, Public Relations and Technical Sections, afternoon.
"Gala Night," entertainment, evening.

Friday, June 19

Registration in morning.
Fourth general N.E.L.A. session, morning.
Convention adjournment about 1.30 p.m.

All morning sessions will start at 9:30 and wil last until 12:30. Afternoon sessions will be opened at 2:30 and will close at 5:30. The meetings of the various sections will be held in rooms at the Exposition Auditorium, and the general sessions will be conducted in the Auditorium proper.

Peninsula Electrical Development League Organized

A gathering of men interested in the development of the electrical industry on the San Mateo peninsula resulted in the formation of the Peninsula Electrical Development League on April 23. After a dinner at the Portola Hotel, Burlingame, Calif., the meeting was called to order by F. J. Kiefer, of the California Electrical Bureau, who acted as temporary chairman. He explained that the purpose of the meeting was to discuss the feasibility of organizing a development league similar to others in successful operation in other sections of California.

He then introduced the following speakers. each of whom pointed out the many advantages of such an organization and enumerated the many benefits that he received from the league of which he was a member: C. B. Kenny, president, San Francisco Electrical Development League; C. E. Hershey, president, Santa Clara Development League; J. S. C. Ross, divisional sales manager, Pacific Gas and Electric Company; Victor Lemoge, president, California Electragists; L. F. Leurey, consulting electrical engineer, San Francisco; H. E. Sandoval, president, Sandoval Sales Corporation, San Francisco; Edward Martin, electrical contractor, San Francisco; and W. F. Price, secretary, California Electragists.

After a very interesting discussion and the usual parliamentary procedure, the Peninsula Electrical Development League was organized to cover the territory from the southern limits of San Francisco to the southern boundary of Mayfield, and the following officers were declared elected: president — C. E. Werry, Werry Electric Shop, Palo Alto; secretary-treasurer—F. A. Peck, Pacific Gas and Electric Company, Redwood City; directors—C. F. Schurk, Schurk Electric Shop, South San Francisco; Seth Cohn, Atlas Electric Company, San Mateo; L. H. Cook, Safety Electric Company, Menlo Park.

The board of directors was authorized to prepare a constitution and by-laws, which were adopted at the next meeting held April 30.

COMING EVENTS

Electrical Supply Jobbers' Association—
Annual Convention—Hot Springs, Va.
June 1-6, 1925

Associated Manufacturers of Electrical Supplies—
Annual Meeting—Hot Springs, Va.
June 8-13, 1925

Northwest Electric Light and Power Association—Annual Convention —
Gasco Building, Portland, Ore.
June 12, 1925

National Electric Light Association—
Annual Convention—San Francisco, Calif.
June 15-19, 1925

Golf Tournament Plans Made by Seattle Electric Club

On May 1 fifty members of the Electric Club of Seattle had announced intentions of participating in the annual golf tournament which was scheduled to start before the middle of the month. Chairmen of three committees in charge of the tournament include R. E. Thatcher, Puget Sound Power & Light Company; T. S. Wood, manufacturers' representative, and D. U. Chamberlain, Globe Electric Company.

The following prizes will be awarded: The president's cup, donated by H. J. Martin, president of the Electric Club of Seattle; club from Spalding's; club from Piper & Taft; club and a percolator from Westinghouse Electric & Manufacturing Company; waffle iron, Edison Electric Appliance Company; club, Whiton Hardware Company; waffle iron, Puget Sound Power & Light Company; driver, Riverton Golf Club; club by Western Electric Company; and a golf bag by the National Lamp Works.

Rural Electrification Is to Be Discussed at Meeting

Rural electrification, reclamation and farm structures will be the main subjects discussed at the meeting of the Pacific Coast Section of the American Society of Agricultural Engineers which is to be held at the Hotel Clark, Los Angeles, at 7 p.m. Friday, May 29.

Prof. B. D. Moses, executive secretary of the California Committee on the Relation of Electricity to Agriculture, will present a report of the work of this committee in California. This project is one in which the agricultural, central station and manufacturing interests in the state are working towards the goal of increasing the efficiency of electricity on the farm. Professor Moses will report particularly on the activities in connection with the investigations on dairy farms, electric brooding of chicks, performance of stationary spray plants, power requirements of the farm shop, and electric pumping.

David Weeks of the division of rural institutions, College of Agriculture, University of California, will discuss his recent economic investigations of state and government reclamation projects in California and Nevada.

Max Cook, farmstead engineer with the California Redwood Association, will present a paper entitled "Farm Structures; Maximum Results at Minimum Cost."

San Diego Electric Club Holds Two Interesting Meetings

Two interesting meetings recently were held by the Electric Club of San Diego. On April 28 the theme of the program was inter-industry cooperation, with R. T. Chace, San Diego, agent for the Westinghouse Electric & Manufacturing Company as chairman. K. E. Van Kuran, division manager for the Westinghouse company in Los Angeles, emphasized the importance of such cooperation toward the elimination of harmful competition. J. M. Morris, also of the Westinghouse organization, showed by means of diagrams the value of each part of the industry to the others, and D. C. Pence, of the Illinois Electric Company, outlined the possibilities of development in San Diego County based upon statistical records and natural tendencies of growth.

On May 5 the program took on a naval aspect, for Rear-Admiral A. H. Robertson, commander of the 11th Naval District in San Diego, was present and disclosed the fact that he had been professor of electricity at Annapolis for a number of years. Lieutenant-Commander Frank Luckel, who was active in the installation of radio stations for the Navy in Alaska, also spoke, dwelling on the importance of communication by cable and radio to the nation in peace as well as in war.

The Foundation Company Starts Work on Dam at Lake Almanor.—Raising of the Big Meadows dam of the Great Western Power Company, work on which was started recently (Journal of Electricity, April 15, 1925, p. 295), is being done by The Foundation Company. The immediate construction involves the raising of the dam 46 ft. and lengthening it to 1,250 ft. from the present 600 ft. The Foundation Company has commenced operations.

Personals

Sir Thomas Callender, managing director of Callender's Cable & Construction Company, Ltd., one of the best known English cable manufacturers, will visit the United States in the near future. Sir Thomas has been one of the pioneers and leaders in the British electrical industry, especially in connection with high-tension distribution. "Sir Tom," as he is known throughout the industry in Great Britain, entered his father's business, that of asphalt street paving in 1873. Through experiments made by himself and his brothers the insulating product known as vulcanized bitumen was discovered and patented in 1881. The following year a company was formed to develop this vulcanized bitumen as an insulator, particularly in the manufacture of insulated wires and cables. This company manufactured and laid down in London and the provinces a large number of the early underground mains. Due to the development of the electrical industry and the consequent increase in the demand for underground mains, the business grew to the point where it became necessary to reorganize the original company, and in 1898 Callender's Cable & Construction Company, Ltd., was formed. In addition to his duties as managing director of the Callender company, Sir Thomas is on the board of a number of its subsidiaries and is also a director of several of the great power companies of Great Britain.

SIR THOMAS CALLENDER

F. G. Barnett, formerly superintendent of motor transportation for the Public Service Company of Colorado, Denver, has been made manager of the company's San Luis Valley district, succeeding A. F. Morairty. **E. J. Graham,** resident chief electrician at the new Valmont generating plant and a former officer of a motor transport company in the Army, has been named as Mr. Barnett's successor.

H. P. Coldwell, chief electrical engineer of the Victorian State Government Railways, Victoria, Australia, was an interesting visitor at a recent meeting of the San Francisco Electrical Development League.

R. T. Stephens, for the past two years division sales manager of the Sacramento division of the Pacific Gas and Electric Company, has been appointed manager of electric sales for that company in San Francisco. He succeeds H. E. Sandoval, who recently resigned to engage in business for himself. Mr. Stephens has been in the employ of the Pacific company since December, 1921, and has been engaged in sales work in nearly every division of the company, including San Francisco, San Jose, Shasta, Colgate, De Sabla, West Side and Sacramento. He has been an active worker in the Pacific Coast Electrical Association and other electrical organizations, and is well known by the members of the industry. He received his degree of bachelor of science in mechanical engineering from the University of Michigan.

A. R. Hathaway, for the past two years chief clerk at Bellingham, Wash., for the northern district of the Puget Sound Power & Light Company, Seattle, has been transferred to Pawtucket, R. I., where he will have a position in the office of the assistant treasurer of the Blackstone Valley Gas & Electric Company.

E. W. Weathers, electrical engineer of San Diego, has announced his appointment as San Diego representative of the Blackstone Engineers. Mr. Weathers for some years owned the Weathers Motor Shop, selling that business not long ago to enter private practice as consulting engineer.

F. O. Broili, Nevada Machine & Electric Company, Reno, Nev., visited San Francisco recently in the capacity of consulting engineer for the Elko municipal water system and the Mineral Company power system.

C. N. Stannard, vice-president and general manager, Public Service Company of Colorado; **W. C. Sterne,** general manager, Municipal Properties Investing Company; **A. C. Cornell,** Rocky Mountain manager, Western Electric Company; and **D. D. Sturgeon,** prominent Denver electragist, were among the electrical men who attended the recent division convention of the Rotary Club at Colorado Springs.

A. E. Vieau, Crouse-Hinds Company, Minneapolis, was a recent visitor in Salt Lake City.

P. E. Matteson, sales manager, Intermountain Electric Company, Salt Lake City, recently visited the Pacific Coast, spending some time in both Los Angeles and San Francisco.

W. S. Vivian, director of public relations of the Middle West Utilities Company of Chicago, was the principal speaker at the weekly luncheon of the Salt Lake City Rotary Club held recently in that city.

John W. Hubbard, of Hubbard & Company, Pittsburgh, was a recent visitor in California.

A. H. Wyman, former manager of the Salt Lake City branch of the Allis-Chalmers Manufacturing Company, is now manager of the Cleveland branch. **H. E. Weiss,** formerly service engineer of the company in Chicago, succeeds Mr. Wyman.

G. F. Kinkaid of the Idaho Power Company, Boise, was a recent visitor in Salt Lake City.

H. D. Brown and **F. N. Murphy,** electrical engineers, are in charge of the motion picture electrical pageant to feature Shrine week, which will be held in Los Angeles in June.

D. S. Jones, Center, Colo., a former member of the Colorado legislature and politically active for a number of years in Republican circles, has been appointed by Governor C. J. Morley as a member of the Colorado Public Utilities Commission, succeeding **Grant Halderman,** whose term expired last January. **F. P. Lannon** of Pueblo, Colo., has been named chairman of the commission.

Thomas Duncan, president, Duncan Meter Company, Lafayette, Ind., at a recent meeting of the San Diego Electric Club, gave an interesting account of his engineering experiences on a trip through Africa from Cairo to Cape Town. **A. F. Blecksmith,** representative of the Duncan Meter Company in Los Angeles, accompanied Mr. Duncan from Los Angeles.

A. L. Clarke, formerly in the radio service of coastwise and foreign shipping as radio operator, recently has taken over the business of the Electric Lighting Supply Company, 4000 Piedmont Avenue, Oakland, formerly owned by B. R. Fritz. Mr. Clarke will conduct an exclusive electric appliance and supply shop and specialize in radio.

S. I. Weill, until recently general accounting superintendent of the installation department of the Western Electric Company, New York, has been appointed assistant to the vice-president of that company in charge of the telephone department. Mr. Weill studied electrical engineering at the University of California, Berkeley, and entered the employ of the Pacific Telephone & Telegraph Company in 1909 to engage in engineering work at San Francisco. He went subsequently to Portland where he occupied a number of important posts related to construction and plant. In 1917 he was back in San Francisco on the staff of the general superintendent of plant, and was then transferred to the American Telephone & Telegraph Company as accountant in New York. He went overseas as first lieutenant in the signal corps with the 317th Field Signal Battalion and was later district signal officer, advance section. On his return he rejoined the American Telephone & Telegraph Company, but in 1923 he left to become general accounting superintendent of the installation department of the Western Electric Company. Mr. Weill's home is in Maplewood. He is a member of the Braidburn Country Club and chairman of its membership committee.

S. I. WEILL

G. I. Drennan, for many years traveling inspector for the Pacific Power & Light Company, with headquarters at Walla Walla., Wash., has been promoted to be field superintendent. The scope of his duties has been enlarged to include jurisdiction over certain phases of employee relations, particularly with reference to accident-prevention work.

A. F. Morairty, district manager of the Public Service Company of Colorado with headquarters at Alamosa, Colo., has been promoted to the position of assistant to V. L. Board, general superintendent of the company at Denver, succeeding E. H. Coe, who has become manager of the Central Arizona Light & Power Company, Phoenix, an Electric Bond & Share property. Mr. Morairty recently was elected to the presidency of the Colorado State Association of Chambers of Commerce following his designation as head of the Alamosa County Chamber of Commerce. Along with these offices he also holds that of secretary of the Rotary Club in Alamosa, troop committeeman in the Boy Scouts, member of the advisory board of the Order of De Molay and is chairman of social and community welfare work in his home city. He is also active in N.E.L.A. work and Shrine activities. He is a native Coloradoan having been born at Boulder, Dec. 27, 1888. He attended the grade and high schools in Denver and later received his E.E. degree at the University of Michigan. His first position was with the Colorado Power Company, predecessor of the Public Service Company, in plant construction work, and then by successive stages he became a substation operator, steam plant operator, system dispatcher, assistant local manager, then local manager at Leadville, Colo., and finally manager of the San Luis valley district of the company. Mr. Morairty is a great believer in civic and community building especially from the utility viewpoint, as evidenced by his participation in experimental projects which will lead to the building of the first beet sugar plant in his section of the state and an ice plant for the refrigeration of certain vegetable crops, especially head lettuce. Since he became manager of the San Luis valley territory three years ago Mr. Morairty has extended the service of his company to seven new towns, one of which formerly had a municipal plant, and has secured a 20-year franchise in each.

A. F. MORAIRTY

G. G. Caldwell has joined the San Francisco Bay region sales staff of Moe-Bridges Company. Mr. Caldwell will devote his time to calling on the dealers in that territory.

William Mulholland, Los Angeles, and **C. E. Grunsky**, San Francisco, consulting engineers, recently were authorized by the directors of the Sacramento Utility District to review the report on the Silver Creek project made by Albert Givan, city manager, and submit a joint report of their findings.

H. B. Squires, of H. B. Squires Company, San Francisco, Pacific Coast representative of the Cutler-Hammer Manufacturing Company, recently attended a conference at the latter's plant in Milwaukee, Wis.

A. D. Blanchard, formerly af the engineering department of Charles Cory & Sons, Inc., New York, is now a member of the industrial sales staff of that organization.

J. J. Mullin, vice-president, Maloney Transformer Company, St. Louis, was a recent visitor on the Pacific Coast, spending some time in Los Angeles and San Francisco.

D. M. Shreeve, for some time assistant to the manager of the Sandpoint, Idaho, division of the Mountain States Power Company, Albany, Ore., has been promoted to be manager at Sandpoint, taking the place of **Lee Bennett**, recently transferred to Corvallis, Ore., as local manager.

H. B. May recently was introduced to the electrical fraternity of San Diego by **E. M. Ellis**, as the new General Electric Company representative and resident agent for San Diego.

K. E. Van Kuran, district manager of the Los Angeles division, Westinghouse Electric & Manufacturing Company with his family and **Ralph Hopkins**, were visitors to San Diego early in the month.

L. E. Stiers, Stiers Electric Company, Compton, Calif., was a recent visitor in San Francisco.

J. D. Kent, formerly salesman in the Colgate division of the Pacific Gas and Electric Company with headquarters at Marysville, Calif., has been appointed division sales manager of the company in West Side division with headquarters at Red Bluff, Calif.

R. L. Ward, civil engineer formerly in the construction department of the Southern California Edison Company, Los Angeles, is now in charge of the storm drain department at the Wilmington branch of the Los Angeles city engineer's office.

J. H. Spraggon, formerly with the Westinghouse Electric & Manufacturing Company, has joined the sales staff of the Electric Service Supplies Company, Philadelphia.

J. G. Miller, since 1921 engineer in the valuation department of the Southern California Edison Company, Los Angeles, has been appointed power engineer for the American Trona Corporation, Trona, Calif., in charge of steam generation, refrigeration, and generation and distribution of electric power. The American Trona Corporation is one of the largest manufacturers of potash, borax and other similar chemicals in the United States. These chemicals are obtained from the brine of Searles Lake. After graduation from Sibley College of Engineering, Cornell University, in 1914, Mr. Miller was for three years field engineer for the late L. L. Nunn of the Telluride Power Company, in the investigation, valuation and purchase of engineering properties. During the war Mr. Miller was in charge of instruction at the training school of the United States Signal Corps, after which he received valuable experience as office engineer and assistant purchasing agent with the Texas Construction Company, an Electric Bond & Share property. He spent nine months in the same organization on the construction of the Leon River steam generating plant of the Oil Belt Power Company of Texas. On completion of this plant several months were spent in placing it into operation and in building up the plant efficiency. In 1921 he joined the force of the Southern California Edison Company.

J. G. MILLER

Obituary

M. R. Bump, since 1910 chief engineer of Henry L. Doherty & Company, in charge of all engineering and of the construction and operating departments of the public utility division, died in Denver, May 5, after an illness of two days. Mr. Bump was born at Rock Falls, Wis., March 18, 1881. He received his early education in the schools of Spokane, Wash., and was graduated in electrical engineering from the University of Wisconsin when he was twenty-one, immediately taking up engineering work with The Washington Water Power Company of Spokane. He joined the Doherty organization in 1904. Among the positions he has held were: instructor in electrical engineering at the University of Wisconsin; first cadet engineer of the Doherty training schools; engineer for the gas department of the Denver Gas & Electric Light Company; examining engineer for the Doherty company; and treasurer and general manager of the Empire District Electric Company, Joplin, Mo. At the time of his death he was vice-president of the Cities Service Company, which controls the Public Service Company of Colorado. Mr. Bump was president of the National Electric Light Association for the term 1921-1922.

TRADE NOTES

Decker Electrical Construction Company, San Francisco, recently has moved into its new quarters. A lease has been signed on a two-story concrete building on Bryant Street, between Third and Fourth Streets, that will give much needed additional office and warehouse facilities to take care of its rapidly expanding contracting business. Peter Decker, head of the company, states that more business is booked and in sight at the present time than has been the case at any similar period for years past.

The Okonite Company, Passaic, N. Y., has established recently a branch office at 221 Stock Exchange Building, Los Angeles. E. C. Wescott, formerly general sales manager of the Marbelite Corporation of America, has been appointed district manager of the Los Angeles office.

Westinghouse Electric & Manufacturing Company, Pittsburgh, now has on the market a complete line of structural pipe fittings, designed for use with common wrought iron or steel pipe in the erection of outdoor or indoor electrical switching equipment.

General Electric Company, Schenectady, has announced the development of a new type of synchronous motor for direct drive of slow-speed reciprocating compressors which have their greatest application in furnishing compressed air or artificial refrigeration.

Fullerton Distributing Company, Los Angeles, recently has been formed by J. B. Fullerton to sell the National Cleaner, a new washing machine, which will be manufactured by the Apex Electrical Distributing Company, Cleveland.

A. H. Holtermann, formerly of Holtermann's Electric Shop, 89 Market Street, San Francisco, has taken over the line of electric fans and toys of the Knapp Electric Corporation, New York, and will act as its exclusive representative on the Pacific Coast for the states of California, Washington, Oregon and Nevada. He also will represent the Arnold Electric Company, Racine, Wis., in California, handling its line of vibrators and hair dryers.

The Newport Contracting & Engineering Company, Newport News, Va., has been awarded the contract for an extension to the power plant at Bremerton, Wash., for which $90,197 has been appropriated.

The United States Electric Company, 710 Polk Street, San Francisco, has started manufacturing electrodes, for violet-ray machines. W. L. Wilson is proprietor of the company, which is operating as manufacturers' agent and wholesaler of electrical specialties.

Pass & Seymour, Inc., Syracuse, N. Y., recently has placed a new device on the market known as the P & S 3316 canopy switch, a new pull chain canopy switch which it is stated has an exceptionally smooth easy action.

Automatic Electric Heater Company, Warren, Pa., recently has placed on the market a new and approved electric temperature regulator which has been designed particularly for use with domestic coal or oil-burning furnaces.

F. W. Wakefield Brass Company, Vermilion, Ohio, manufacturers of "Red Spot" lighting specialties, has issued a new series of condensed data sheets on its entire line.

The Karl Andren Company, 250 Congress Street, Boston, recently has been appointed distributors for Robbins & Myers motors for New England territory.

Jones-Thorne & Company, Inc., San Francisco, has recently opened new and enlarged offices in the Chancery Building, 564 Market Street. They are representatives in that city of Fort Pitt Spring & Manufacturing Company, and A. W. Cadman Manufacturing Company, Pittsburgh, and of R. D. Wood Company and Cook Cedar Company, Philadelphia.

D. D. Sturgeon, electragist, Rotarian, vice-chairman of the Denver Electrical Cooperative League and member of 'most everything else, needs no introduction. He is one of the "go-getters" who are electrifying everything in Denver and vicinity.

Gainaday Electric Company, Pittsburgh, recently has announced a new washing machine, which it is claimed contains many attractive new features.

P. A. Geier Company, Cleveland, manufacturers of Royal electric vacuum cleaners, recently held its annual convention at its factory in Cleveland, sales, advertising, clerical, manufacturing and administration departments participating in the event.

Jewell Electric Instrument Company, Chicago, has issued recently an attractively bound and profusely illustrated booklet containing extensive information concerning its varied line of instruments.

Square D Company, Detroit, has purchased recently an addition to its main plant at Detroit, which enlarges the floor space twenty-five per cent, thereby giving better production facilities.

The Buckeye-Prima Company, Sidney, Ohio, recently has placed a new device on the market for use of tourist camps in equipping their barbecue stands with a driving mechanism, and has issued an illustrated booklet descriptive of this new device. Another booklet of interest describes the Prima Never Crush safety wringer, which it is stated has many advantageous new features.

Commercial Engineering Laboratories, Inc., Pittsburgh, Pa., recently has introduced a new product called the X-C. E.L. foot switch that it is placing on the market. It is a device adaptable for automobile horns, stop light and directional signals, call bells and electric locks. Made of heavy rust-proof metal, it is claimed to be practically indestructible.

R. L. Barker & Company, Chicago has issued a new pamphlet describing its new model "E" Barker sander and grinder, for which are claimed many interesting features.

The Newbery Electric Corporation, 726 S. Olive Street, Los Angeles, has been appointed agent for the Electro-Kold Corporation, Spokane, manufacturers of the Electro-Kold electric home refrigerator. This agency is to cover the Los Angeles territory for the product of the Spokane concern.

Plibrico Jointless Firebrick Company, Chicago, recently has issued a new edition of its catalog containing 36 pages, well illustrated and descriptive of its furnace linings. Free copies may be obtained by addressing the company's office at 1130 Clay Street, Chicago.

Kingsbury Machine Works, Philadelphia, represented in San Francisco by the Western Engineering Company, Matson Building, recently has issued a descriptive bulletin of Kingsbury thrust bearings, dimensions, capacities and mountings. The bulletin contains many drawings and photographs depicting new types of appliances.

W. A. Jones Foundry & Machine Company, Chicago, recently has developed the Lemley Model "F" friction clutch to meet the demand for a medium and light-duty clutch which it is stated can be applied conveniently to practically any machine or countershaft which requires a friction clutch.

Johns-Pratt Company, Hartford, Conn., has developed a new type of trough for connecting adjacent Noark service entrance switches. It is claimed the use of these troughs provides a most convenient and inexpensive method of wiring together the adjacent cabinets and materially reduces the amount of labor involved.

The Demmert Company, which represents the Cutter Electric & Manufacturing Company, Sundh Electric Company, and the Jenkins Manufacturing Company, has opened offices at 405 Call Building, San Francisco, in charge of I. M. Chinn. The company for some time has had offices in Los Angeles where Otto Demmert is personally in charge.

The Albert Sechrist Manufacturing Company, Denver, recently has opened offices in Salt Lake City at 214 Judge Building under the supervision of R. C. Shrake. Business of the Intermountain region will be handled through this office.

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Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES

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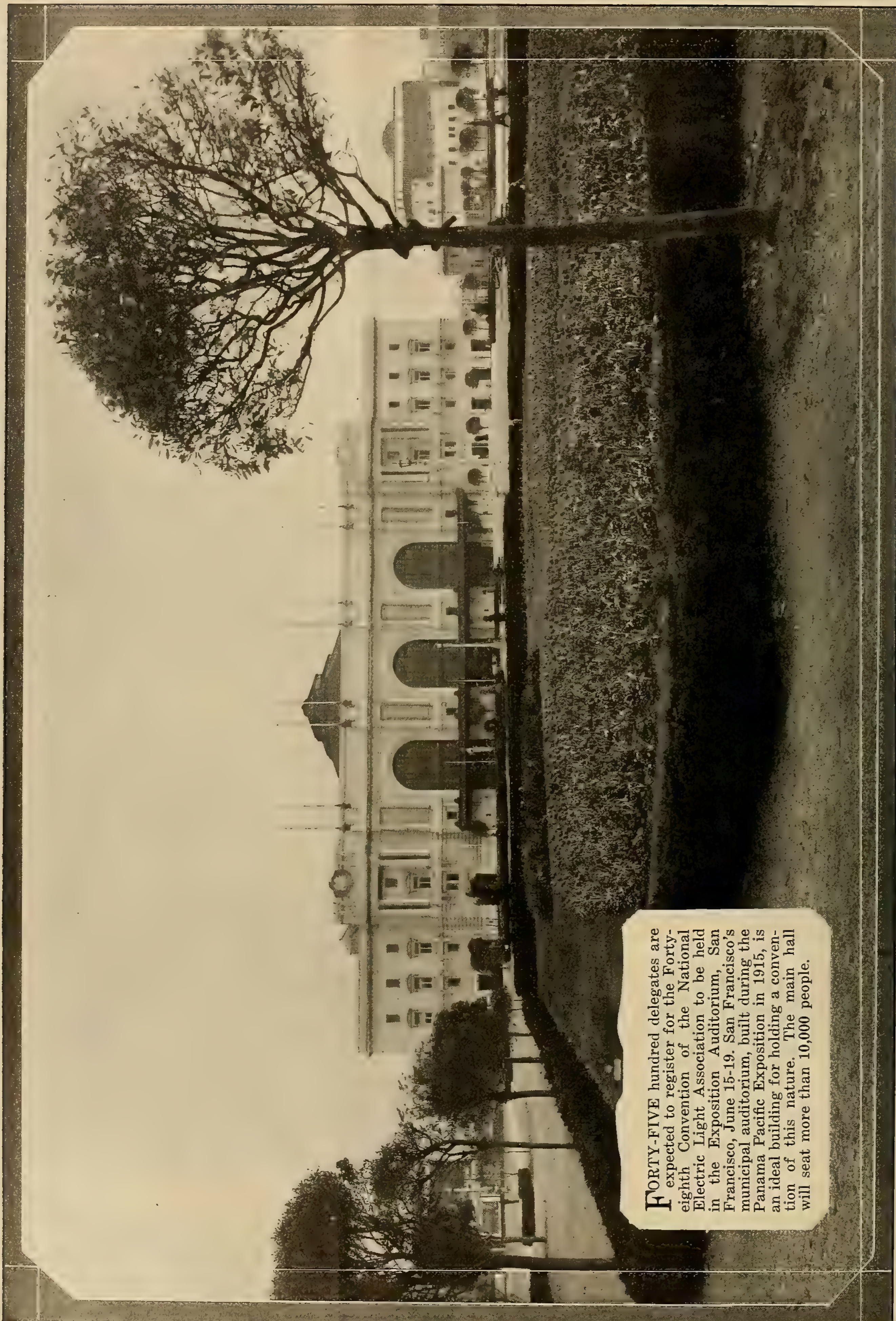
EDITORIAL

Committee Reports of the Pacific Coast Electrical Association

THIS issue of the Journal of Electricity contains what ordinarily would be the convention papers of the Pacific Coast Electrical Association, in accordance with its usual custom instituted several years ago. Since, however, the National Electric Light Association holds its annual convention in San Francisco, that of the Pacific Coast Electrical Association will consist of no more than a brief business session for the purpose of electing officers and for the transaction of routine business. Thus the only convention that the Pacific Coast Electrical Association will hold for 1925 will be within the covers of this and, we hope, succeeding issues of the Journal.

ALL in all, the papers prepared by the various committees this year represent the finest effort that has yet been made in the annals of the Pacific Coast Electrical Association. The mere fact that there are to be no formal meetings at which these papers will be presented does not detract in the least from their interest and value. On the contrary, it behooves every member of the Association to devote as much time as possible to the study of these papers after the rush and bustle of the N.E.L.A. convention is over; then, having studied and digested the reports of the various committees, written discussion should be prepared and sent to the secretary for publication in the annual proceedings. Lacking the benefit of oral discussion, there will be something gained at least through the careful study and the thought that is required to prepare a written discussion or criticism of the papers.

IT is to be hoped that all of the members of the Pacific Coast Association will study carefully the papers presented in this issue and submit written discussions within the scope of the papers in which the different members personally are interested and informed. A little effort on the part of the P.C. E.A. members can make the 1924-1925 fiscal year stand out as one of real accomplishment in the history of the Association.



FORTY-FIVE hundred delegates are expected to register for the Forty-eighth Convention of the National Electric Light Association to be held in the Exposition Auditorium, San Francisco, June 15-19. San Francisco's municipal auditorium, built during the Panama Pacific Exposition in 1915, is an ideal building for holding a convention of this nature. The main hall will seat more than 10,000 people.

Increasing the Use of Electrical Appliances

Report of Appliance Bureau, Commercial Section.*

THE plan of work of the appliance bureau for the year 1924-1925 was concisely stated by T. W. Berger, chairman of the appliance committee of the National Electric Light Association, in his letter outlining the national committee's plans. First, to produce data now available and make new studies to show the value of the household appliance load; second, to recommend definite selling plans for various appliances, outlining in detail each step necessary to conduct a successful campaign.

At the first meeting of the appliance bureau it was decided to conform the year's work to the second recommendation, as other agencies were already engaged in the survey recommended in the first suggestion. Toward this end two papers have been prepared and are presented as part of this report. The papers are: "A Suggested Merchandising Plan for Central Stations," by A. L. Spring and H. C. Rice, and "Dealer's Plan for Selling Small Appliances," by D. D. MacFarlane and J. T. Deppe.

We believe that the practical thoughts and suggestions embodied in these articles cannot fail to improve appliance sales provided they are actually followed by the central station and dealer. It is unfortunately true that more able committees of the past have also presented admirable working plans to which a small degree of attention has been paid by the industry. Recommendations only, without the necessary tools of putting them in actual operation, mean a very small percentage of realization on an appliance bureau's year's work.

It is the appliance bureau's recommendation to the members of the Pacific Coast Electrical Association that very serious thought be given to the tying in of the Bureau's work with the actual operation of selling plans, modified to suit local conditions, administered by a salaried representative. It may be feasible to associate the bureau work with that of some already organized branch of the electrical industry on the Pacific Coast. Possibly a reorganization or a combination of the present paid branches could be effected. The appliance bureau considers that unless some practical method is devised for following up recommendations that the greater part of the year's work is lost.

One of the proposed activities for the current year was the adoption of a special percolator campaign plan. The subcommittee appointed for that purpose found too varying opinions as to the best methods to be able to recommend a complete selling plan at the time of this report. Certain plans and methods are now being tried and the subcommittee is planning to turn over to its successor some practical experience which may be embodied in next year's actual operations.

One of the outstanding observations of this year's work is the increasing indifference on the part of the great number of electrical contractor-dealers to the further development of electrical merchandise sales, and to the absorption of this business by the specialty dealers and department stores. The absence from this field of the central station is quite apparently not contributing to the merchandise sales of the electrical contractor but only diverting it to other classes of merchants. It may not be the proper time to turn electrical appliance sales over entirely to interests engaged as merchandisers only. There is still a big job to be done in California and elsewhere to promote the use of more appliances. The most effective means, and the most interested concern is the central station.

* H. C. Goldrick, Western Electric Company, chairman; G. W. Barker, Allied Industries, Inc., vice-chairman; W. C. McWhinney, Southern California Edison Company, secretary; R. E. Heerman, S. & H. Service Electric Company; Fred Lantz, Lantz Electric Company; J. H. Jamison, Westinghouse Electric & Manufacturing Company; E. A. Norton, Barker Brothers; H. C. Rice, Southern California Edison Company; D. D. MacFarlane, Newbery Electric Corporation; J. T. Deppe, Pacific States Electric Company; A. L. Spring, General Electric Company; L. E. Moselle, Los Angeles Bureau of Power and Light; H. B. Jenkins, Southwest Electric Company; J. C. Hobrecht, J. C. Hobrecht Company; Alfred May, San Diego Consolidated Gas & Electric Company.; E. S. Alexander, Alexander & Lavenson Electric Supply Company; H. A. Cram, Landers, Frary & Clark; M. S. Henoch, Westinghouse Electric & Manufacturing Company; B. M. Tassie, Manning, Bowman & Company; R. E. Tompkins, Pacific States Electric Company; A. H. Nicoll, Western Electric Company.

A Suggested Merchandising Plan for Central Stations

By A. L. SPRING and H. C. RICE

CENTRAL stations are interested in the sale of current consuming devices primarily from the point of increased use of current. They will obviously work out their own policies governing electrical merchandising, and it is not the purpose of this report to recommend an uniform policy, but to suggest a plan to those central stations interested in selling electrical household appliances.

A well organized sales department of a centarl station wields a tremendous influence toward popularizing the use of electrical household appliances and betters its public relations through the contact thus obtained with its consumers. As electric appliances can still be considered specialties requiring constant effort to maintain public interest, the central station merchandising department has a duty to perform to assist in introducing electrical appliances to the general public and in so doing will create a demand that will be reflected in increased business to all of the merchants handling electrical household devices.

Any central station merchandising department should carry itself. The merchandising department should be on a sound business basis and should carry a full line of appliances so that it will be in a position to render complete service to its consumers. The following plan is suggested in accordance with the plans of the appliance bureau, as outlined at the conclave in Los Angeles, Oct. 17, 1924.

At least four yearly sales should be held by the central station in which the entire industry can participate. It does not matter much which article is selected as an example, but it has been suggested that the percolator be the first article on which the sales drive should be made. These monthly sales should have as their special feature—

1. Low price
2. Easy terms
3. Some point of sale which can be highly advertised such as allowing $1 for the return of an old coffee pot.
4. The device selected should be such that any electric dealer or merchant can participate on the same plan if he so desires.

The appliance campaign should be used as a leader to get the public interested in other household labor saving devices.

From the central station standpoint such sales could be stimulated by allowing each employee a commission on sales made, in addition to his regular salary, increasing the commission for sales made out of office hours. In addition to the above special monthly sales, a plan whereby all employees of the company can be rewarded with a suitable commission in addition to their regular salary both on sales made in the office and on their own time, will materially increase the sale of appliances for any central station.

The electrical dealers can tie-in with the above plan with their own employees by using a similar schedule of commissions.

Every central station employs a great many people in various lines of work. Most of these have some sales ability. Many of them can be developed into remarkably good salesmen and saleswomen. By allowing each employee in the organization, to sell, and by paying a commission on each sale made, it can readily be seen that instead of having one or two salesmen working out of an office, there will be 40 or 50 or more, depending upon the number of employees. These employees will welcome an opportunity to make a little extra money through the sales of electrical appliances. The

following schedules of commissions are suggested, divided between office sales and sales made outside of the office.

On office sales a commission of 10 per cent to be paid; 5 per cent going directly to the person making the sale, 5 per cent to be pooled, the pool to be divided amongst those employees who do not come in contact with the public in the office, yet whose work would be increased by the added sales.

Ten per cent commission to be paid on outside sales, the entire amount going directly to the person making the sale.

Fifteen per cent commission to be paid on slow moving appliances. On office sales of this kind 7½ per cent will go to the person making the sale and 7½ per cent to be pooled. On outside sales the entire 15 per cent will be paid to the person making the sale.

Commissions should be paid promptly each week.

Office employees to qualify for participation in the pool must sell three appliances on each drive before they are eligible.

The central station plan of merchandising can be amplified considerably by offering groups of appliances at a special price and offering a premium for a limited time on such sales. Another important feature is to get the employees of the central station and electrical dealers to use electric appliances, and it is felt that special prices should be made to enable these employees to buy at the lowest price possible. A user of electrical appliances is always an enthusiastic booster. All advertising material sent out should be so worded as to direct the public either to the central station or to their nearest electrical dealer, when all concerned are agreed upon the particular sales campaign to be followed.

The above plans, if carefully worked out and followed up, should result in a great many sales being made by the central station employees in such a manner that the employee and company would be benefited by them. Commissions allowed are liberal in view of the fact that employees already are on a salary, and in the course of a month they should amount to a considerable sum.

A Dealer's Plan for Selling Small Appliances

By D. D. MacFARLANE and J. T. DEPPE

PRACTICAL merchandising is fundamentally based on factors and practices with which we are all familiar. We recognize the individual factors in the science of mechandising but we do not always realize that all of these factors and practices must be co-ordinated before the system of merchandising can function.

It is our intention in this article to disregard the contentions of those who claim that the sale af electrical appliances presents different problems from those presented by other lines—to disregard also the arguments of those who claim that to successfully sell electrical appliances other lines must be introduced. Our contention is that by recognizing the individual factors of merchandising and by applying them that the sale of electrical appliances can and will be increased whether the appliance line be sold by itself or incorporated with other lines.

Let us take some of the factors in merchandising, analyzing each in a brief way, viz: location, window display, attractive interior, merchandise well displayed, neat, courteous and intelligent service, merchandise that itself represents value. As this paper must of necessity be brief, we are not going to mention the subject of advertising, although we recognize it as an essential factor in the merchandising system. The amount and the kind of advertising that is done by individual stores depends so much upon the nature of the store itself that we believe it unwise to try to cover this important subject in a brief way.

The location we will have to take for granted as we are primarily addressing this paper to established dealers. We do not in any way mean to minimize the importance of the location but rather to accentuate the importance of merchandising routine in any given location.

In considering the important factor of window display, we would like to leave this thought: windows must be considered in the same light as a newspaper advertisement, and when a window is dressed it should mean something, just as definite as though an advertisement had been written.

The store interior we will also take for granted in the same way we accepted the location of the store. The arrangement and attractiveness of the interior we must give consideration to, although neatness, cleanliness, orderly arrangement and good illumination we do not always find, but surely there is no excuse for the lack of it. Even if a store is neat and clean, it may not always be attractive, but at least it will not have a negative effect upon the customer. The display of merchandise itself is a problem which needs constant attention regardless of the size or the nature of the stock.

The intelligence and courtesy of the sales people within the store must be carefully considered and personal appearance must be looked after. The sales people must of necessity know the merchandise which they are employed to sell.

The merchandise itself is, of course, the foundation of the whole merchandising structure. We must select attractive merchandise, appropriate merchandise. We must also recognize the appeal of price. Due recognition should be given to the fact that nationally known products both help to establish the store in a favorable position from the customer's viewpoint and to lessen the sales resistance encountered by the employees.

It is impossible to go into greater detail in this paper. We have told nothing new—a fact we recognize. Our only hope is that we may have brought home the fact to someone that in following just the fundamental principles in merchandising there are great possibilities for increased sales. To those who read this paper and are of the opinion that they have put into practice all of the factors of merchandising that we have discussed, thus briefly and inadequately, we can only ask that they walk out of their store—look at the window display as a disinterested person—then walk into their store—look casually around and make a purchase of some article that requires a display of salesmanship on the part of the clerks. We believe that looking at it from the viewpoint of a disinterested person, certain imperfections in a seemingly well thought out merchandising system will be observed. In other words, we all know the merchandising factors mentioned in this paper but in practice some of them are invariably overlooked.

Better Customer Relations Through Our Employees

Report of Customer Relations Bureau, Commercial Section*

THE first meeting of the customer relations bureau was held in Los Angeles Oct. 17, 1924. At this meeting the work of the customer relations bureau of the previous year was reviewed by the chairman and a resume of the discussions and annual report was presented to the new committee.

Each member of the bureau was called upon to give his general idea of the importance of customer relations activity and the bearing which it might have upon the general problem of securing favorable public relations between the central stations and the public. From the thoughts that were brought out in these statements it was plain that the subject of proper customer relations was a very important one in the minds of the bureau members.

As a result of the ensuing discussion it was decided by the bureau that the subject was too large and too broad in its scope to be attacked in its entirety by any one year's committee. To procure successful results would entail more research and more labor than the

time available to any one year's bureau would permit. It was the consensus of opinion that the bureau for 1924-25 should concentrate its efforts on some one phase of the subject for a thorough study and a report embodying concrete and definite recommendations.

With a view to carrying out this policy the bureau decided that probably the most important subdivision of the problem of customer relations was that of employees' relations with the public, and that this resolved itself primarily into the question of the conduct of the employees in their daily contact with our customers.

It was then decided by the bureau members that the principal activity for the year should be the compling of a set of instructions which would definitely outline to our employees their proper conduct when transacting business with our customers. For purposes of preliminary study, the subject was divided into several subdivisions, each member of the bureau assuming the task of studying the conditions surrounding his particular subdivisions and of preparing suggestions and recommendations to the chairman for further discussion by the entire bureau at a later date.

The second meeting of the customer relations bureau was held at San Rafael, Nov. 19, 1924, upon the occasion of the meeting of the National Commercial Section. The session was a closed meeting, entirely informal, and was for the purpose of going over the work which had been done by the various members of the bureau up to that time. The suggestions which had been turned in were analyzed and final decisions were made for the benefit of the chairman, who was to compile the final draft of the instructions to employees.

This set of instructions, or employees' manual, has been made the major part of the report of this year's bureau. It is the result of a great deal of thought and study by the bureau members individually and collectively. The bureau believes that the proper conduct of our employees when they are transacting business with our consumers is the very foundation upon which to build a structure of satisfactory public relations, and it believes that in the set of instructions which they have compiled they have furnished a method by which any company executive can instill into his employees a knowledge of the proper manner in which those employees shall act in their daily routine work.

These instructions will not be self-executing, of course, as is nothing of this nature. They will require conscientious interpretation and application by those in the company organizations who are directly responsible for the actions of their employees. But the committee believes that it has supplied in written form that which we have hitherto lacked, i.e., a short, terse guide to the proper conduct of employees. It is the earnest hope of the bureau members that it will meet with the approval of the Commercial Section.

As was stated before, the question of satisfactory customer relations is a large and complex one and contains many factors. The bureau wishes to bring to the attention of the Commercial Section some of the more important ones not only to bring about a realization of the various problems involved, but also as a suggested basis for the work of the bureau during the coming year. It must be remembered that there is no particularly new and astounding thought to be brought out; that there is no strategic move to make which will at once cure all of our troubles, but that on the other hand, improvement of our customer relations will only come through continual effort, never-failing patience and the performance of one small act of courtesy or service at a time. Our final favorable position in our relations with our customers will be the result, not of one big activity, but of an infinite number of small acts, performed one after the other.

One of the most important subjects which attracted the attention of the bureau members was that of the possibility of having a higher type, or perhaps we had better say, a better adapted type of employee in those positions where we come in contact with our customers. There is not a company which to a greater or less degree does not have in its organization men who are not suitable for their positions, due perhaps to some lack of education, training, or personality. We believe that this calls for the best attention on the part of company executives, and that any thought and effort which can be spent along this line in an endeavor to remedy such conditions will be amply repaid.

Having a close connection with the above thought are two additional ones; that of closely watching the scale of pay of employees in work of the character under discussion, and that of providing a more definite advancement or promotion plan. With reference to the first thought, often it will be found that to obtain the employee suitable for some particular class of work will call for an increase in the pay for this work. There should be no hesitancy in carrying out such a policy, for if there is any place in our organizations where men and women can be valuable to us and worthy of their hire, it is in those places where they meet our customers and are in position to make friends or enemies for our companies. The result of their actions are usually not known to us until afterwards and the damage which may have been caused usually far exceeds in cost the slight additional pay which a more suitable employee should command.

A definite promotion plan will also be of distinct assistance in procuring the proper type of employee. It is human nature for any of us to work harder and more conscientiously when we can see the next step in our upward clim. Nothing so stifles an employee's initiative and ambition as to be in a place where he cannot see something definite ahead. It is the belief of the bureau members that this phase of the status of the employees is worthy of serious study.

In connection with the thoughts which have just been noted, the bureau wishes to call attention to the policy of one of the large oil companies of California, which has made an enviable record in winning a favorable opinion from the public, through the inauguration of a public relations policy which has functioned chiefly through the actions of its employees who are in contact with the public. Quite a thorough study was made of some of its practices, made available through the courtesy of the oil company officials.

The company has a definite promotion plan, which provides a man, as soon as he goes to work in a service station, with a definite future, so that he knows at all times what he has to work for and what the rewards of his efforts will be. In recruiting its service station operators (which, by the way, officials state to be the source of the larger part of the male employees), an endeavor is made to obtain college graduates. The company pays a scale of wages which runs a considerable percentage above the prevailing scale for a similar class of work. A man must not only be physically suited to the work, and, in fact, pass a physical examination, but he also must be fitted temperamentally for the location in which he may be placed. In a city like San Francisco, for example, the officials state that they are exceedingly careful not to place men in the residential district of Ingleside Terrace when they should be in the manufacturing district south of Market Street. They claim to have noticed very direct results in the financial returns in a service station when the wrong type of man has been stationed there. To illustrate how carefully they have gone into this subject, we are allowed to state that they now have gone so far as to place a height and strength limit below which an applicant must not fall. Their reason for this is that when a man is promoted from a service station to a tank wagon they have found that the work was so arduous that a small man usually was not capable of doing the day's work without being physically so exhausted as to be unable to present the courteous, cheerful manner which they desired to have him exhibit at all times. Certainly, if this oil company, with its exceptional record of results, has found it desirable to go into this question of the fitness of its employees for their particular position to the extent which it has done, it must be worthy of serious consideration.

Another phase of the customer relations question which received attention of the bureau was that of the proper education of employees. This is a large subject in itself and includes not only their education in the requirements of their particular job but also education in respect to general company policies, company activities, physical facts concerning the company and information concerning public utilities. This educational work is being done to a greater or less extent in practically every organization, but with very little uniformity of plan. Some companies were found which carry on more or less extensive work along one or more of these lines, but practically ignore the rest. In some of the companies the work follows a general scheme which is in effect throughout the organization, while in others this

work has been dependent upon the initiative and ideas of various department heads, resulting in the education of only a few of the employees.

The bureau believes this work to be of sufficient importance to call for a more detailed investigation of company methods, results attained and the dissemination of this information among member companies. The bureau members also wish to go on record as expressing the belief that the most of this work is not the proper function of employees' organizations. This work should be a definite part of fitting the employees for their positions, and it does not seem that it falls within the scope of activity of an organization where attendance and study is a voluntary matter.

At this point we wish to call attention to the "Employees' Manual" which is being distributed by the National Electric Light Association to the member companies. It is an excellent compilation of information valuable to public utility employees and should produce beneficial results. The manual which this bureau submits, will in no way conflict with the one above mentioned, but rather will supplement it, as the entire manual of the bureau is covered in two pages of the N.E.L.A. publication.

A subject also discussed at some length was that of providing uniform dress for its employees whose work would lend itself to such a practice. This applies more particularly to meter readers, trouble shooters, meter men, etc. It is believed that two distinct objectives would be gained by following such a course of action, both of which would have a favorable bearing upon customer relations. The first would be a neater personal appearance of the employees, and there would also be a psychological effect which the uniform would have upon an employee which is of some consequence. We believe that the general result would be better appearance and a more alert and business-like manner on the part of the employees. Second, there is no question but what the public would be much more favorably impressed with the employees, and the uniform would also instill a certain amount of confidence in the customer, with a beneficial result. The bureau feels that an investigation to ascertain the number of companies who are now following this policy and their opinion of the results attained, would be of value to the member companies.

As stated before, the bureau has made no pretense of covering the entire subject of satisfactory customer relations in this year's work. It has endeavored to call attention to some of the more important phases so that they might receive your thought and consideration as well as act as suggestions for the next year's committee and it has endeavored to provide a definite answer to one of the questions presented by this subject. The bureau does not feel that it is within its province to lay down the work for the next year's members, further than the suggestions which have been made, believing that the incoming committee can best determine for itself the most important line of investigation which it should undertake.

The bureau presents this report, together with the "instructions to employees," which follow, with the hope that it will arouse in the members of the Pacific Coast Electrical Association, to some degree, a realization of the importance of satisfactory customer relations, and with the hope that it has presented a certain amount of assistance in the solution of one of the important questions involved.

To Member Company Executives

Much has been written and more has been spoken on the very important subject of "Public Relations." It is regrettable that so many of the written words lie hidden and unused in our desks; that so many of the excellent ideas to which we have listened with interest at conventions, with a determination to put them to practical use in our own organizations, have faded into the limbo of forgotten things before we are fairly at our desks again.

But progress is being made. And most significant in this progress is the growing realization that, of the many angles to the problem of satisfactory public relations, the one which embraces our direct personal contact with the customer is without doubt the most important; and further, that this portion of the problem will never be solved by broadsides of publicity directed to the public en masse nor by exhortations to our employees on the subject of good service. We must go farther than these methods allow us, and it is necessary to analyze more minutely our objective and the paths thereto.

In doing so, we find that our relations with our customers are determined primarily by the actions of the rank and file of our employees and very little by the personal behaviour of the management. While our executives are coming in contact with one customer, the employees are meeting hundreds. It has been and will continue to be a shock to many of our executives to learn at some time or other, in spite of their high ideals of courteous treatment and adequate service, in spite of their orders and instructions given to employees in an effort to transform these ideals into realities, that the public still does not receive the standard of service or courtesy which the management desired should be given.

The reason for this state of affairs is two-fold. First, the number and character of our points of contact with our customers have not been properly analyzed and their significant factors sufficiently appreciated; and second, it does not suffice to tell an employee to "do" or "be" something; we must also tell him "how." And the "how" in this case is the significant point in the solution of our problem.

In making our inquiry into our points of contact we find that they are several in number and that they include almost as many different mental types. It is perfectly obvious then that different methods must be employed to convey the same idea to all of them if we are to obtain a uniform impression in their minds. To order "courtesy" will produce entirely different actions in the college graduate, and the workman who earns his pay by the sweat of his brow. To instruct them to be neat means one thing to the counter clerk and something entirely different to the meter setter. And yet it is easily possible for both of these employees to fulfill our ideals.

A study will show that for each group of employees who make contact with our customers there must be a distinct and different method of imparting instructions, in order to insure a uniform understanding of how we expect them to assist us in attaining our ideals of courtesy and adequate service. As indicated above, neatness must be explained and defined in one way to a counter clerk and in an entirely different manner to a meter setter. To do this effectively it will be necessary to determine not only the various positions in our organization where our employees meet our customers, but—and this is most important—we must analyze the mental characteristics of the class of employees who will be likely to be found in these positions.

A search through available written material revealed nothing specific to meet this particular requirement. There are plenty of admonitions to instruct our employees and emphatic reminders of the necessity of good service and courtesy if we are to enroll our customers on our list of friends. But there is apparently a dearth of material to assist the man who actually desires to give detailed assistance to the employees in his organization. This is the condition which has served to justify an attempt in this direction. The "instructions" which constitute a part of this report represent an effort on the part of the customer relations bureau of the Pacific Coast Electrical Association to supply some concrete, definite assistance to the man who wishes to transmit to his employees some specific instructions as to their treatment of the public. It is not expected that it will prove a cure-all, nor are the "instructions" self-sufficient. They merely provide the groundwork for further effort on the part of the company official who desires to improve the conduct of his employees but lacks a definite and specific foundation.

While these "instructions" are compiled for direct distribution to the employees, such an act alone will be of little value. The majority of our employees will not accomplish much in this direction through their own initiative. To them it is difficult to convey the importance of this subject. Only by the most painstaking efforts and continual watchfulness can we imbue their minds with our ideals of service and the methods by which we strive to attain them. Therefore, it seems necessary that the group executive, whether he be foreman, chief clerk or local manager, be held directly responsible for the manner in which the employees absorb the spirit of these instructions. His degree of sincerity will measure the results which will be obtained from the employees. He must act as interpreter and critic,

and it is to him particularly that we hope we may have been of assistance. Successful results will further depend upon the support given the group executives by their superiors, and little good will result unless it can be known throughout the organization that the company executives demand that the customer receive the utmost of courtesy and service.

The "instructions" are self-contained and are intended for individual distribution to the employees. All the material is suitable for study by all departments.

The language of the suggestions has purposely been put in brief and concise form. It was felt that this form would better convey a specific idea than would too much elaboration. Furthermore, the expansion of the idea presented is really the function of the group executive and it is in this that the opportunity is presented to convert the employee to our way of thinking.

Great care has been taken to avoid any statement which would conflict with any company's policy or routine procedure. The sole purpose has been to convey to the employee the correct idea of what his conduct should be when he is in contact with the public. It is hoped that his effort will assist in some degree the solution of that very important phase of "Public Relations"—"Employees' relations with our customers."

* H. K. Griffin, Western States Gas & Electric Company, chairman; F. V. Boller, San Joaquin Light & Power Corporation, vice-chairman; Robert Cardiff, Coast Counties Gas & Electric Company, secretary; D. C. Ray, Pacific Gas and Electric Company; P. S. George, Coast Valleys Gas & Electric Company; G. M. Rankin, California Electrical Bureau; Alfred May, San Diego Consolidated Gas & Electric Company; L. D. Sherman, Great Western Power Company; A. W. Childs, Southern California Edison Company.

The Proper Treatment of Our Customers

Prepared by Customer Relations Bureau, Commercial Section*

Your Responsibility

DID you ever realize that what a consumer thinks of you is often what he thinks of this company? Did it ever occur to you that thousands of this company's consumers have never met more than one or two of our employees? Is not their opinion of our company almost certain to be based on the treatment you have given them?

It follows then that **you are the company** to the most of the people who patronize us. If you have been courteous, performed your work intelligently, answered questions patiently and have given the treatment you would like to get yourself, then that consumer will form an opinion of our organization that will be a credit to you and to us. If, on the other hand, you have not conducted yourself in quite the proper manner, the impression left with that person is one of antagonism, or at least dislike, which may take years to overcome. Indeed it may never be entirely corrected.

This company is selling a service; not something to be bought by the pound. It is a service that is necessary to the life, health and business of our community; almost as essential as the air we breathe. If we fail in our daily duties and our service ceases, our fellow citizens have nowhere else to turn; they are dependent upon us for something that is vital to their very existence. We all of us have, then, in addition to our daily work, a responsibility to our community; the responsibility of furnishing a service which is a necessity of life. Our consumers demand, and rghtly so, that this service be rendered courteously, and in a way that will cause the least inconvenience to them. If they receive this kind of service they will be our friends, and our list of friends is the biggest asset of this company.

We are striving constantly to improve the quality of our service but we must depend upon you to give it. The largest part of the responsibility of this service rests **with you.** As it depends so greatly on you to see that our customers receive what we are trying to give them, it is natural that we should watch your treatment of them. We have found that people are quick to appreciate earnest efforts in their behalf, and we wish to recognize those of you who put forth these efforts. Need it be said that advancement and promotion will come more quickly to those of you who have made a record of honest endeavor to give service to our customers?

We recognize that mistakes are often committed unknowingly. We are, therefore, giving you a few instructions so that you may know exactly how we want you to treat our customers. It is the little things in life that count, and it is the little acts of courtesy and the little efforts toward service which will be remembered by our customers, for they mean so much to them. These instructions refer entirely to **how** your work should be carried on, and not to the details of the work itself. Routine may change from day to day, but its object will always be more and better service, given with a maximum of courtesy. A thorough understanding of the spirit of these instructions will be invaluable to you in your work. It can always be followed no matter where you are in our organization.

To ignore the instructions that we are giving may be the cause of making enemies for us. To follow them will assist us in giving the service we desire and will build up a record for yourself that will be of great assistance to you in the advancement for which we are sure you are striving. We are offering these instructions to help you make yourself better in your work. If we succeed in that, our company will benefit, and we do not need to emphasize that your prosperity depends upon the success of the company for which you work.

General Instructions

On the following pages you will find instructions to different classes of employees in our company. These have been prepared to guide you in your daily contact with the public. We desire that all employees read all of the instructions contained herein, paying special attention to the ones given under your particular classification.

It should be noted, however, that there are employees in our company whose work does not come under any of these classifications, but who, nevertheless, are in touch daily with some of our customers, perhaps at home or at social gatherings. In the instructions which follow, such employees will find the suggestions which will fit their case and which will be easily recognized by them.

If any doubt arises in your mind as to the particular instructions which apply to your class of work, the head of your department will be glad to discuss them with you.

Courtesy to Your Fellow Employees

Be courteous to your fellow employees. Your first thought will be the question: "What has this to do with the public?" The connection is indirect but very apparent. When you have been treated discourteously by a fellow employee you feel it and are very apt to show it in your manner. If the next person with whom you deal is a consumer, you will probably be a little less considerate toward him even though you may be unconscious of any change in your manner. Courtesy between employees will secure more polite treatment by all of us to our customers.

Apart from this personal side, mutual courtesy will create a feeling of fellowship and friendliness throughout our organization which will make our work more pleasant for all of us. The effect of this spirit cannot help but secure more considerate attention to our consumers.

Cooperation Between Departments

Quite often in the course of your duties, it may be necessary for you to work with other departments of our organization. When this occurs, approach that department in the spirit of cooperation rather than that of shifting responsibility.

By working in harmony, friction is eliminated and the work is accomplished in less time, with much better satisfaction to the consumer and at smaller cost to the company.

Should an error, made by another department or by a fellow employee be brought to your notice, do not feel, since it is not your mistake, that you have no responsibility in the matter. Correct it if possible, and if you can not, call it to the attention of some one who can.

An error, however small, if not discovered and corrected at once may cause needless inconvenience to the consumer and expense and trouble to the company.

Outside Criticism

Never criticize another department or employee of our company when talking to a consumer. If you can-

* A few instructions to guide central station employees in their daily relations with the public.

not make a clear explanation of the subject under discussion, simply state that you will have it investigated. Criticism of your organization or any part of it to outsiders shows your lack of confidence in it. Consumers will not have confidence in your statements or judgment if you show that you have none in your fellow employees. When you make such statements you destroy confidence in yourself as well as in your company. You have hurt yourself and have not helped the consumer. Nothing will so quickly destroy our confidence in you as to learn that you criticize our company or your fellow employees when in conversation with our consumers.

Report Complaints

If any complaint, misunderstanding, or case of poor service on the part of our company comes to your attention outside of your regular work, report it promptly to the department concerned. This will allow us to give much quicker attention to the trouble than might be the case if you did not report it, and it also will be valuable in that the customer will appreciate your interest in him, and will more readily believe that we wish to give him the best possible service.

Rates, Rules and Regulations

Do not attempt to explain rates, rules and regulations to consumers unless you are sure you thoroughly understand them. If you are at all in doubt about the question, refer it to the proper department. There are many mistaken ideas among our consumers about the manner in which our company must operate. You will be doing any consumer a favor and making friends for the company when you assist in clearing up any misunderstanding, either by giving the proper explanation yourself or by referring the matter to the one who can do so.

Service Before Routine

Do not allow yourself to become a slave to routine. While it is necessary that this company work by certain standard rules, yet our first desire always is to render service to the consumer in the best possible manner. To do this it is often necessary for you to depart from our regular procedure, and at times to request the assistance of other employees and departments in order to accomplish the desired results. If you have not the authority to do what seems necessary, consult the head of your department. Your efforts in this respect to assist us in serving the consumer will be very pleasing to us and will work to your advantage.

Proper Use of Telephone

The proper use of the telephone by all employees is one of the most important phases of our company's business. The customer can not see you and must judge you solely by what he hears and how he hears it. To create a pleasing impression by telephone is not always easy, and the endeavor to do so calls for your best efforts.

Answer your telephone promptly.

Never say "Hello." Answer by giving your name and department. If the call is received directly from the outside without coming through a company switchboard, give the name of the company first, followed by your own name.

Give close attention. The party calling has the right to expect that you are listening to him. Don't force him to repeat due to your inattention.

Keep your mouth close to the telephone and talk in an ordinary tone of voice. Shouting will blur your speech and talking too low will make your words difficult to understand.

Use a pleasant tone. Your voice is your only means of impressing the consumer that you are at his service. Make it courteous.

Don't argue. You are justified in making statements of fact as near as you know them, but don't argue about them. You may be wrong and you weaken yourself and your company by being drawn into an argument.

Let the consumer close the conversation. Don't run the risk of hanging up before he is through.

Say "Thank you" when possible in closing a telephone conversation. This is proper in many more instances than might appear at first thought. For example, it is right that we should thank any customer for calling in regard to a complaint, for we appreciate information as to laxity in our service and we welcome every opportunity to clear up a misunderstanding of any kind with a consumer.

If a person called is not available, be sure that the name and telephone number of the party calling are transmitted to him as soon as possible. Assure the consumer that you will give his call to the person to whom he wishes to speak.

If, by chance, you have been called by mistake and are not the one with whom the consumer wishes to talk, be especially courteous and use your best efforts to get the right one in our organization for him. It was probably not the error of the party calling and your effort to accommodate will be appreciated.

When desired information cannot be given without undue delay, request the name and telephone number of the consumer and say you will call as soon as possible. **Don't fail to keep your promise.**

Above all, be courteous in tone and words; **the consumer can only "see" your voice.**

Salesmen

A neat personal appearance is more essential to the salesman than to almost any other class of employee. First impressions are the most lasting and an untidy appearance will create an unfavorable opinion of you and your company.

Make a practice of shaving daily. Keep your shoes shined and your clothes cleaned and pressed. Clean linen is inexpensive and essential. Be careful of the appearance of your finger nails. Watch these details and avoid any chance of personal criticism.

Avoid the use of tobacco while conversing with others. It may be offensive to them.

If you are a power salesman you must be thoroughly familiar with your company's rates and regulations. If you are selling appliances you must know your merchandise. Such knowledge is absolutely essential if you are to create a feeling of confidence in your prospective customer.

Keep in mind that your prospective customer knows his own business better than you do. He may even know more about the application of your commodity to this business than you do. Go carefully until you know your ground. Show every consideration to his opinions.

Do not make promises unless you know they can be fulfilled.

By many of the people with whom you come in contact you are looked upon as being an authority on company matters. It is therefore essential that you keep fully informed in regard to the operations and general policies of the company. You must use great care in making statements and promises. If you are asked a question and are in doubt as to a correct answer, do not guess. Tell your questioner you will obtain the requested information for him. Take no chances on an incorrect or ambiguous reply. It may cause serious trouble for your company and the consumer.

You will often be required to listen to complaints concerning some part of our company business. Give such matters your full attention and refer them to the proper department. We consider such work just as essential to your success as obtaining the new business.

You have an exceptional opportunity in your work to build up good will for your company. Your word is accepted as authority on company business. Use all care that you do not put yourself and the company in an embarrassing position by giving information carelessly, or inaccurately. This will destroy confidence in you and in us.

To a salesman it should not be necessary to speak of courtesy. To be successful you must have it in a certain measure. But we also ask you to give "consideration" to the people with whom you come in contact. It is the highest type of courtesy. Be considerate of their opinions, their circumstances in life, their surroundings. You must avoid the "know it all" attitude. Regardless of what you are doing, it will make friends for you and for us.

Applications and Contracts

In the majority of cases you are the first of our employees with whom our consumers come in contact. The impression made by you at this initial meeting will, to a large extent, determine their idea of this company. First impressions are always most lasting and it is

with this in mind that we urge upon you the importance of using every effort to correctly carry out your duties with proper courtesy and consideration to our consumers.

Special attention should be given to your personal appearance. Clean linen and well kept hands are essential.

A thorough knowledge of our rates and regulations is absolutely necessary. Take time to make a full explanation to the consumer of the particular condition applying to his installation. Be most particular in obtaining correct names and addresses from the consumers. Misspelled names may mean a delayed bill, and wrong addresses are almost certain to cause a delay in service to the consumer as well as any amount of extra labor and trouble in other departments of the company. You cannot use too much care in this part of your work.

Make your explanations in simple terms. Remember that your everyday "working" language is as so much Greek to the majority of consumers. Talk to them in terms that will be plain to them and don't resort to the routine language of the office.

Be sure that you understand exactly the class of service desired by the consumer and that the correct rates are applied. It is often necessary to question the consumer to a certain extent before you will be certain as to what class of service is desired. Guard against appearing impertinent or inquisitive.

Be careful about giving figures as to monthly cost of service. Consumers often request information as to what their bills will be, and they are quick to take any statement of ours as a promise on our part. Avoid this. If necessary, do not hesitate to refer them to the department which can go into the matter more fully.

Do not make ambiguous statements. They oftentimes cause us a great deal of trouble. Leave no room for doubt in the consumer's mind in regard to any part of your conversation.

Avoid the use of the phrase "You will have to." There are many other ways of telling the consumer that it is necessary for him to do certain things to conform to our regulations. None of us like to be told that we "have to" do anything. In the case of a public utility particularly, people resent this phrase.

Be interested in the consumers. Make them feel that you have a personal interest in their affairs as far as our company is concerned. They are almost wholly ignorant of our business and a personal interest displayed by you will cause them to feel that we are anxious to assist them. Remember that each consumer at the counter is a human being like yourself.

And last, and most important of your duties, is courtesy, always and never failing. It is most productive of success in your work and at times it will be most difficult to achieve. You will have those to contend with that will try your patience until courtesy seems almost impossible. But courtesy on your part will keep you in command of the situation and can never bring criticism upon you. It is your best weapon against the "hard to handle" customer, and your characteristic which will be longest remembered by all of them.

Requests for Information

These may come to you no matter what position you may hold in our organization and it is needless to point out the importance of the replies you give. It is essential that they be correct, and if in any doubt, be sure you obtain the proper information for the consumer.

If you are a telephone operator or information clerk it is your duty to be thoroughly familiar with the work of the various departments and the men in those departments who meet the consumers. Use great care to see that the consumers are directed to the proper person in our organization. It is very annoying for them to repeat their story several times to different people before they reach the right one.

It will often be necessary to question the consumers considerably in order to know where to direct them. This must be done tactfully and courteously. Remember that they probably know nothing of our organization and have little idea of how our work is conducted. Do not become impatient if they do not seem to know just what they want. Our business is a mystery to the most of them.

Cashiers

The payment of any bill is not particularly agreeable to anyone; make the payment of bills for our service as pleasant as possible. Be neat in your personal appearance. Greet each consumer with a smile, a pleasant greeting, and a "Thank you" when he leaves. Do not turn away from a consumer until he starts to leave.

Do not argue regarding a bill. If you cannot explain the account to the consumer's satisfaction, refer him courteously to the person whose duty it is to investigate such matters.

Make change promptly and carefully.

When currency, from which change is required, is given in payment, leave the currency in sight of the consumer until the change is counted and accepted. You will thus avoid any argument as to the amount of currency given you.

Do not carry on unnecessary conversation while other consumers are waiting.

Do not leave your desk during rest periods unless someone is at hand to relieve you.

Complaints

In interviewing consumers who have complaints, you have one of the most difficult and important duties of any in our organization. Bear in mind that in the majority of cases the consumer is sincere and is convinced that his grievance is legitimate.

Consider that this consumer is entitled to your full attention while you are interviewing him. Endeavor to make him feel that you are taking a personal interest in his case and will see that he gets everything to which he is entitled. To do this successfully you must be sincere in your manner and thorough in looking into the grievance. Don't neglect anything which may have a bearing on the case. It may cause a worse complaint later.

Give those complaints which come in over the telephone the same thought and attention as those reported in person by the consumer.

Be courteous—never risk embarrassing yourself or the company by arguing or insisting that the consumer is at fault. Many times he is not.

Investigate each complaint thoroughly and follow it up until it has been attended to, with the idea always in mind that any trouble that may exist should be corrected as soon as possible.

Do not make promises unless you know without doubt that they can be fulfilled.

Remember that the consumer is not as familiar with our service as you are, and do not confuse him with technical terms. Use simple language in your own explanations. He will appreciate your courtesy in not confusing him with unfamiliar words.

Accounting Department Employees

Although your work does not often bring you in personal contact with the public, yet the quality of your work has an important bearing upon our relations with our customers.

An error in computation leads to a complaint which always takes time and effort of other employees to correct.

But the worst result of an error is the impression left with the consumer that he "caught" us in a mistake.

Make plain figures. Illegible figures lead to mistakes by other employees. When appearing on a bill, they exasperate a customer.

Collectors

Collectors have one of the most difficult jobs in our organization. No one likes to be dunned even though they know the bill is just. To keep the right balance between collections and satisfied consumers is no easy task.

Do not allow yourself to depend wholly upon the "money or meter" policy. While in some cases it is necessary for us to remove a meter for non-payment of account, yet when that meter is out we are earning no money at that address. Removal of the meter should be the last resort.

You will be judged by the skill you show in obtaining payments and terms for settlement without resorting to meter removal. Many delinquent accounts will show possibilities of settlement within our rules, if they are examined with tact, courtesy and a little human kindness. In cases of dispute, don't argue. Verify your

facts. The apparent delinquency may have been the result of our mistake.

Be neat in your personal appearance.

Above all, be courteous and polite in all cases. Allow no provocation on the part of the consumer to cause you to forget your dignity and that of the company you represent.

Setting and Removing Meters

Be clean. Self respect is largely a matter of personal appearance, and you cannot expect the people with whom you come in contact to have respect for you unless you show respect for yourself. Just because you wear working clothes is no reason why you should not shave regularly and keep your hair combed.

Be courteous. Answer questions courteously, even foolish ones. Remember that your work, which appears simple to you is more or less a mystery to the average man or woman. If the consumer desires to be shown how the meter is read, a short, simple explanation does not take long, and will usually convince the consumer that there is no magic, or what is more important, no guess work about it.

In a great many cases you are the first representative of the company with whom the customer comes in contact, and it is essential that you make a good impression. On entering the porch or house of a consumer, wipe your feet, remove your hat, and while doing your work try to make as little dirt, noise or fuss as possible.

Insofar as the company rules permit, you should check over the consumer's appliances before turning on the service, to make sure that our meter and service are of sufficient size. If there appears to be trouble when the service is turned on, do not condemn the man who made the installation, but look around for the defective device which often is the cause of the trouble.

If you cannot set the meter due to some defect in the job or to some infraction of a rule, such as wrong type of meter box, doors too small, etc., be sure the consumer understands the cause of the delay. Don't say "It's the company's rule" and let it go at that, but try to explain the matter from the standpoint of safety or convenience to the consumer.

Leave the consumer's premises in as neat a condition as you found them. Don't walk over lawns or flower beds, and when you enter or leave the yard close the gate after you. These may seem to you to be small details but they mean a great deal to the average housekeeper.

Familiarize yourself with the company rules which apply to your work and if there is any doubt in your mind as to the proper interpretation of any point, consult the head of your department as to the correct meaning of the point in doubt.

If in some respect the information on your work orders does not agree with what the consumer has in mind, do not try to place the blame on anyone. Explain the discrepancy the best you can without criticism, and clear up the matter when you get back to headquarters. If mistakes in other departments cause you trouble, report them to your superior. Do not tell your troubles to the consumer. Read the paragraph on "Outside Criticism" under "General Instructions."

Meter Readers

Be clean. Shave regularly, and if you wear a white collar, be sure that it is clean; a clean soft shirt collar looks a great deal better than a dirty white one.

Be courteous. Remember that the meter reader is almost the only representative of the company with whom the consumer comes in contact after the original installation is made. Every word you say, every move you make, and particularly your appearance will be a contributing factor in forming the consumer's opinion of, and attitude toward the company.

Don't jump fences or walk on lawns or flower beds. If the meter is in a locked porch or other enclosure, and there is nobody at home, do not force an entrance. Treat the consumer's premises as you would want your own place to be treated.

Be accurate. Remember that bills are made out from your readings and a mistake on your part usually causes a great deal of trouble.

Trouble Shooting

You have an exceptional opportunity in this work to make friends for our company and leave behind you a record of courtesy and helpfulness which will be of great assistance to us and to yourself. Every call you make is the result of some trouble or inconvenience to the consumer. He is looking to you for help and when you give him assistance in a polite and courteous manner you leave behind a friend to you and to our company.

On arriving at a house in the daytime go to the rear door; if at night call at the front door to avoid frightening anyone who might be timid.

State your errand briefly and if your company credentials are requested, produce them promptly and pleasantly.

Be sure that you remove your hat upon entering the house. See that your shoes are clean.

If necessary to stand on a chair, ask for a kitchen chair and see that the seat is properly protected by paper or otherwise.

Be sure that any dirt you may have made is cleaned up before you leave.

If the cause of the trouble is not immediately apparent, take sufficient time to locate it and be sure the consumer is satisfied before you leave.

If you are unable to make a permanent repair at the time, see that the proper notation is made on the trouble tag in order that it may be followed up by the right department.

If the trouble requires work for which the company makes a charge or which should be handled by an outside contractor, explain this to the consumer so that it is clearly understood.

If you see any fault or defect in our own system be sure that it is noted and turned in on your report so that it may be corrected by the proper department.

Do not make promises unless you know that they can be fulfilled.

Answer questions asked by the consumer to the best of your ability. Many of them may seem foolish to you. But remember that your business is a mystery to most people and a courteous reply will be appreciated by them.

If they desire information which should be given by other deparments, put the proper notation on your report so that it may be followed up.

Insofar as your work will permit, keep up your personal appearance. Neatness and cleanliness will go far toward making a good impression on the consumer for the company and yourself.

Construction Crews

Normally your work does not bring you in personal contact with many of our consumers. But do not think they do not see you. The public loves to watch a crew of workmen and they are quick to judge a company by the way its men carry out their duties.

You do not have time to carry on conversations with the public but you will be asked questions now and then. We must leave it to you to know how much time to give to such questions, but we expect you always to be courteous. Rudeness is never called for and is inexcusable.

In working on or near private property, be considerate of the owner. Use the same care with his lawn, fences, flower beds, etc., as you would like to have shown to your own property. There is no excuse for unnecessary damage and we will not tolerate it.

Truck and Automobile Driving

Your car or truck is plainly marked with our company name. You are our representative and we are judged by your actions.

Know the traffic rules thoroughly. Drive carefully. There will be no excuse for breaking the law's requirements.

In heavy traffic don't crowd other cars. Don't be a "road hog." Extend the courtesy of the road at all times.

The public service license on your car does not give you the special privileges of fire apparatus and ambulance. So watch your speed.

Remember that the conduct of automobile drivers is always subject to special attention on the part of the public. Any discourtesy of yours is a reflection on your company.

In Conclusion

When you have read the foregoing instructions carefully you will, no doubt, have seen that they could have been condensed into one short sentence, one which

we have all known for many years, "The Golden Rule." But we have interpreted this rule for you at some length so that you might know exactly what would be expected of you. In this way there will be no misunderstanding by any of us.

As we stated in the beginning, we are selling a service to the public and we desire and insist that this service be rendered with the maximum of speed and courtesy. In no other way can we justify our company's existence. That is the purpose for which we are in business. It is the only way in which we can succeed.

You are looking for advancement and success. In a large measure this depends upon the success of this company, which in turn to a great extent rests with you and depends upon the manner in which you carry on your work.

We have endeavored to blaze the trail to guide you on your way. We know you will not fail in an honest endeavor to follow it.

An Analysis of Domestic Metered Water Heating in California

Report of Metered Water Heating Committee, Electric Cooking and Heating Bureau, Commercial Section*

THIS report is purposely limited to statistical data showing the state of development of the electric water-heating load in California; load characteristics so far as obtainable in the short time available; and the present tendency.

Comprehensive questionnaires were sent to all the member power companies in California asking for information on the following subjects: characteristics of water-heating load; effect of water-heating load on range load; average consumption of water heaters; load characteristics of water heaters of various capacities; proper size tanks; effect of installation on water heating system; proper inter-connection between range and water heaters; diversity of water-heating load; effect of water-heating load on system peak.

All of the companies sent in as much information as was available from their records. Nine power companies reported 7,183 water heaters of the capacities and types shown in the accompanying tables. (The numbers 1-9 used to refer to central stations are for the same companies throughout the report.)

The following table shows the monthly kw-hr. consumption reported:

	Central Station								Ave. monthly consumption
	1	2	3	5	6	7	8	9	
Monthly kw-hr. consumption where contiuous automatic hot water service is supplied....	324		544	100	987	527		489	574
Monthly kw-hr. consumption where water is heated intermittently only......		278	207		360	160	159	150	210

To questions relative to load characteristics the following replies were received:

Question: What is your estimated diversity factor?
Answers: Company 1—We do not know.
Company 2—3 to 1.
Company 3—No particular study.
Company 5—No figures available.
Company 7—No data.

Question: How do the larger water heaters affect the system?
Answers: Company 3—Larger size heaters which we recommend materially increase the demand occasioned by the range load.
Company 5—Not noticeably.
Company 9—Do not consider either appreciably on peak.

Question: How does the water heater affect the range load?
Answers: Company 5—Considering the increased revenue, the combined load is more profitable than either load separately.
Company 7—Not entirely diversified. Estimated increases range peak 30 per cent of water heat load.
Company 9—None when on double throw switch.

Question: What is your rate for water heating?
Answers: Company 1—First 150 kw-hr., 3.3c; all over, 1.6c less 10 per cent. Minimum first 7 kw., $3; all over at 50c per kw.
Company 2—Average for our system is 4.36c. First 150-kw-hr. 4.5c; next 350 kw-hr., 3c ; all over 500 kw-hr., 2c. Minimum 75c per kw. of active heat load, but not less than $3 per month.
Company 3—First 30 kw-hr., 8c (lighting rate); next 120 kw-hr., 4c; all over 150 kw-hr., 1½c.
Company 4—Generally 2c per kw-hr. Minimum 50c per kw.
Company 5—First 150 kw.hr., 3½c; all over, 2c.
Company 6—First 150 kw-hr., 4c; all over, 2½c. Minimum for first 7 kw., $3; all over, 75c per kw.
Company 7—Schedule C. Practically 2c per kw-hr. 150 kw-hr., 3½c; balance, 2c. Minimum for first 7 kw., $3; all over, 50c per kw.
Company 9—First 150 kw-hr., 3½c; all over, 2c. Minimum, $3 for first 7 kw.; all over, 50c per kw.

Question: What is the present prevailing capacity of water heaters operating in metered service?
Answers: Company 1—3 kw. to 5 kw.
Company 2—3.4 kw. average.
Company 3—5 kw. and 3 kw.
Company 4—3 kw. and 1½ kw.
Company 5—3½ kw. and 1½ kw.
Company 6—5 kw.
Company 7—5 kw.
Company 8—4 kw.
Company 9—5 kw.

Question: What is your policy or preference in regard to heater capacities?
Answers: (1) When consumer maintains continuous hot water service in an average home?
Company 1—1½ kw.
Company 2—Low wattage.
Company 3—3 kw.
Company 4—Average 3 kw.
Company 5—Heaters with thermostats. Immersion or circulation type.
Company 6—Small capacity.
Company 7—5 kw.
Company 8—4 kw.
Company 9—1½ kw.
(2) When consumer required only intermittent hot water service?
Company 1—3 or 5 kw.
Company 2—High wattage.
Company 3—5 kw.
Company 4—4 kw.
Company 5—Circulation type.
Company 6—5 kw.
Company 7—5 kw.
Company 8—4 kw.
Company 9—5 kw.

Question: What is your annual cost of servicing or repairing water heaters?
Answers: Company 1—Very small.
Company 5—Practically nothing.
Company 6—Do not service.
Company 9—Very small.

Question: Do you charge the consumer for repairs?
Answers: Company 1—Material but not for labor.
Company 2—Actual cost.
Company 4—Time and material after first year.
Company 5—Nothing first year, then $1.50 per trip plus material.
Company 6—Do not service.
Company 7—Free during manufacturers' guarantee, thereafter free labor, material, plus 10 per cent.
Company 9—No charge first year. Thereafter material plus 10 per cent and labor free.

Summary

More than two-thirds of all the heaters reported are 4 or 5-kw. heaters. About 85 per cent of the water heaters reported are used in conjunction with electric ranges and 15 per cent where no ranges are installed. Of all the water heaters reported 87 per cent are circulation type heaters. Of the water heaters reported 58 per cent are equipped with thermostats and 2,447 of these are supplying continuous hot water service.

The average consumption of the heaters supplying continuous, automatic hot water service is 574 kw-hr. per month or nearly three times the consumption of the heaters supplying intermittent hot water service which averaged 210 kw-hr. per month.

Rates for Water Heating: All the water heaters reported are operating on standard cooking and heating schedules most of which are designed to throw the

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water heating on the 2c rate. Two companies have 1½c blocks and one a 2½c block. However, all but a few hundred of the water heaters reported are operating on the 2c rate, so that the heater supplying continuous automatic hot water service, using an average of 574 kw-hr. per month, produces a revenue of $11.48 per month. The intermittent heater using 210 kw-hr. earns $4.20 per month.

Load Factor: Where continuous hot water service is maintained the load factor is largely controlled by the heater capacity. For instance a 3-kw. automatic heater using 574 kw-hr. will have a load factor of 26½ per cent. Larger heaters will have less favorable load factors and smaller heaters more favorable, while supplying the same service at the same kw-hr. cost, since the amount of water heated determines the consumption.

TABLE I.

Company	Water heaters on metered service	Under 5 kw.	5 kw.	4 kw.	3 kw.	2½ kw.	2 kw.	1½ kw.	1 kw.	Under 1 kw.
		Heater Size								
1..........	61	..	25	...	11	..	12	13	..	..
2..........	360	7	113	19	86	40	69	8	16	2
3..........	685	..	325	...	325	..	25	..	..	..
4..........	138	1	13	4	47	1	13	58	..	1
5..........	230	..	4	4	*140	..	...	66	..	16
6..........	15	1	9	...	...	..	...	...	1	1
7..........	2,500	12	2,125	50	125	25	50	62	25	25
8..........	1,979	..	...	1,979	...	..	..	...	..	..
9..........	1,215	28	256	19	83	12	20	788	..	9
Total.....	7,183	49	2,870	2,075	817	78	189	995	42	54

*3½ kw.

TABLE II.

Company	Water heaters in conjunction with electric ranges	Water heaters equipped with thermostat	Heaters with thermostats supplying continuous hot water service	Circulation type heaters	Immersion type heaters	Combination tank and heaters	Clamp-on heaters
1..........	59	28	28	42	7	11	..
2..........	125	....	....	....	...	..	..
3..........	660	205	....	685	...	..	..
4..........	130	136	136	138	...	..	..
5..........	92	72	68	160	67	5	..
6..........	15	....	....	....	...	..	1
7..........	*2,250	2,500	1,000	2,450	...	..	..
8..........	1,515	....	....	1,979	...	..	..
9..........	1,215	1,215	1,215	800	415	..	..
Total..	6,061	4,156	2,447	6,254	489	16	1

*Estimated

TABLE III.—Boiler and pipe insulation.

Company	No. installations where boilers are covered with 1-in. insulation	No. installations where boilers are covered with 2-in. insulation	No. installations where boilers are covered with 3-in. insulation	No. bare boilers	No. where hot water pipes are insulated	Standard recommendation for boiler insulation
1.......	50%	50%	....	1	None	2-in.
3.......	....	....	....	....	....	2-in.
4.......	....	110	2	16	....	2-in.
5.......	75%	23%	2%	10%	5	1-in.
6.......	....	....	....	3	1	2-in.
7.......	90%	8%	2%	30	200	2-in.
9.......	All	....	....	None	Few	2-in.

TABLE IV.—Sizes of Boilers recommended. Capacities in gallons.

Company	Small homes	Average homes	Large homes
1..................................	18 to 30	30	....
2..................................	30	....	....
3..................................	24 to 30	30	50 to 60
4..................................	....	30	....
5..................................	18	24	30
6..................................	30	40	60
7..................................	30	30	52
9..................................	30	40	60 to 80

Double Throw Switches: The reports show that practically all of the reporting power companies are recommending 1½ to 3-kw. heaters without double throw switches in average homes where the heater is to maintain continuous hot water service and 4 or 5-kw. heaters with double throw switches where water is to be heated intermittently only.

The double throw switch appears to be satisfactory where the heater capacity is relatively large whether or not the water is kept hot, but usually not satisfactory when heaters are smaller than 4 or 5 kw.

New Development: A new system of domestic water heating in which an automatic water heater is provided with 3 gal. of storage within itself and a limiting valve installed at the top of the tank in the line from the heater arranged so that the amount of water kept hot can be limited to 3 gal. or the entire contents of the boiler heated, is proving very popular. All these heaters reported are operating on standard cooking and heating rates, supplying continuous hot water service with a consumption of 250 kw-hr. or less.

Conclusion: Electric water heating is a success on a meter rate of 2c per kw-hr. On this rate about one-third of all the water heaters reported are supplying continuous automatic hot water service. However, the proportion of consumers maintaining continuous hot water with its desirable effect on load and revenue will, naturally, increase or decrease as the rate for such service increases or decreases.

An average size automatic water heater, say a 4-kw. heater, on a 2c rate, earns an annual revenue of $137.76 or $34.44 per kw. per year. A 3-kw. automatic water heater supplying the same service earns $45.92 per kw. per year.

Recommendations: In view of the fact that so little information was obtainable relative to load characteristics, the committee recommends that the incoming committee arrange to borrow the instruments which are now being used in the Northwest section on range load, for the purpose of obtaining more accurate information for next year's report on water heating.

Electric Domestic and Commercial Cooking

Report of Electric Range Committee, Electric Cooking and Heating Bureau, Commercial Section*

THE introduction of the electric range took place twenty years ago but it has been only in the past few years that the real value of this appliance as a load builder has begun to be appreciated. Consequently, during the last five years the majority of this business has been secured and progress made toward the enlightenment of the public as to the many advantages to be derived from the use of electricity for cooking.

Those companies actively engaged in promoting range sales have, in recent years, been gathering data on the characteristics of the load. The result is an accumulation of charts, curves and other statistics of a piece-meal nature. These have served to furnish those immediately associated in the work with valuable information necessary to most effectively handle the business but have not proved sufficiently authentic to convince a great number in the industry of its true status. Hesitancy, due to lack of these figures and charts, has been a retarding factor in the development of this field of the electrical industry in many localities.

Of particular importance, therefore, is the survey being undertaken at present in the Northwest by a special range survey committee under the auspices of the N.E.L.A. The program outlined is of such magnitude and the data to be collected so comprehensive and universally applicable that, predicting that results will substantiate figures already determined on a smaller scale, it is believed increased activity is certain to follow.

It is the purpose of this committee, therefore, not to touch upon the engineering problems presented but to

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TABLE I.—Domestic range installations only.

Central station	Ranges installed Jan. 1, 1925	Ranges installed Jan. 1, 1924	Per cent of increase	Apt. houses using electric ranges Jan. 1, 1925	Apt. houses using electric ranges Jan. 1, 1924	Per cent of increase	Average kw-hr. consumption per range
Cal. Ore. Pwr. Co.	1,663	1,356	22.6	26	19	37	141
Central Ariz. Lt. & Pwr. Co.	6	6	0	0	0	0	...
Coast Counties Gas & Elec. Co.	125	75	66.6	2	0	...	151
Coast Valleys Gas & Elec. Co.	170	110	54.5	0	0	0	...
Desert Pwr. & Water Co.	11	8	37.5	1	1	0	53
Elko Lamoille Pwr. Co.	36	.....	....	...	...	...	...
Flagstaff Elec. Lt. Co.	8	6	33.3	2	2	0	125
Great Western Pwr. Co.	2,774	2,060	31.8	69	53	30.2	150
Los Angeles Gas & Elec. Corp.	100	80	25	1	1	0	147
Nev.-Cal. Pwr. Co.	12	12	0	0	0	0	...
Ontario Pwr. Co.	670	620	8.1	0	0	0	215
Pacific Gas & Elec. Co.	5,715	4,359	31.1	25	21	19	150
San Diego Consol. Gas & Elec. Co.	518	433	19.6	0	0	0	168
San Joaquin Lt. & Pwr. Co.	1,700	1,400	21.4	14	12	16.6	120
Southern Ariz. Pwr. Co.	24	22	9.1	1	1	0	350
Southern Cal. Edison Co.	4,947	4,667	6.0	2	2	0	254
Southern Sierras Pwr. Co.	1,039	725	43.3	2	2	0	126
Truckee River Pwr. Co.	517	478	8.2	12	10	20	180
Turlock Irrig. District	460	130	254.0	2	1	100	180
Upper Verde Pub. Util. Co.	20	5	300.0	1	1	0	...
Vallejo Elec. Lt. & Pwr. Co.	79	71	11.3	3	3	0	153
Western States Gas & Elec. Co.	482	316	52.5	3	1	200	145
	21,076	16,939	24.4	166	130	27.7	165

confine itself to the commercial side of the business. Aside from the statistics gathered to show the progress recorded by the various member companies, the principal purpose of this report is to determine the extent to which the use of electric ranges has developed in the homes of those engaged in the industry and to investigate wiring costs in an endeavor to devise means to lessen resistance caused by this incidental expense.

In obtaining current data and statistics for the report, the committee is indebted to the power companies and manufacturers for their cooperation.

Present Status and Future Possibilities

The value of the electric range to the power companies of the West cannot be overestimated. Due to the absence of thickly populated centers in close proximity to one another, together with a generous portion of the country's water power, the central station companies in this section must look for a substantial portion of their growth by creating an ever-increasing use of their product in the homes of present and future consumers. The electric range affords almost unlimited possibilities in this regard.

Statistics gathered by a publication devoted to our industry indicate a total of 1,105,070 domestic consumers of electricity served by the utilities in the three states of California, Nevada and Arizona, as of Jan. 1, 1925. Of this number but 2 per cent have been sold the convenience of electric cookery. Table I shows, with the exception of approximately 1,000 ranges on the lines of small municipally operated plants and those of commercial companies, the total number of domestic ranges connected to lines of all companies in this section, the increase for 1924; and reported average monthly kw-hr. consumption per range on lines of various companies.

Notwithstanding the handicap placed upon some of the companies in California last year due to the water situation, some progress is to be noted. A total of 4,137 ranges were reported connected to lines of all companies in this section representing an increase of practically 25 per cent.

Included in the 21,076 ranges reported in operation as of Jan. 1, 1925, slightly less than 10 per cent are being used by a more or less transient element in the 166 apartment houses so equipped. This exerts a tremendous influence as an educational medium as does the equipment used daily by more than 10,000 pupils in the home economics departments of the 69 schools so outfitted. As a great many of the apartment house dwellers later become owners or renters of homes wherein they will desire electric ranges, so do the school girls of today become the housewives of tomorrow. Particular attention should be paid, therefore, to the increased use of electricity in the schools as well as in apartments and flats.

It is evident that the field for the use of electricity for cooking and baking has scarcely been scratched, and that concerted effort on the part of the central station companies, manufacturers, jobbers and dealers will open up almost unlimited avenues of revenue for all concerned and further raise the high standard of living already attained by the people of the West. The revenue from ranges in but 2 per cent of the wired homes in this section adds in excess of $1,000,000 annually to the income of central stations. These figures will furnish some idea of the possibilities yet to be realized. An excerpt from the report of one company shows revenue derived from total domestic lighting consumers as compared to that derived from total domestic range consumers in the same locality. Table II shows the value of this load as a revenue producer.

Those Engaged in the Electrical Industry Versus the Electric Range

An outstanding obstacle toward a greater increase in the use of the electric range can be laid at the door of the electrical fraternity itself. The indifference to their responsibility in the use of electric ranges by the employees of power companies, manufacturers, jobbers, dealers, in fact, the great majority associated in the work of our industry, is one of the problems requiring solution before the progress warranted by the superiority of this method of cookery can be made. To

TABLE II.

Comparison of revenue derived from domestic lighting consumers only with that derived from a smaller number of consumers using both lighting and cooking in the same locality.

Month	No. of domestic light cons.	Monthly rev. from domestic light cons.	Per cent increase or decrease	Monthly rev. per cons.	*No. of domestic cook. cons.	Monthly rev. from domestic cook. cons.	Per cent increase or decrease	Monthly rev. per cook. cons.
1923								
July	4,195	$7,434.00	....	$1.77	793	$3,428.61	....	$4.43
Aug.	4,529	7,736.65	+.041	1.71	806	3,471.51	+.013	4.31
Sept.	4,812	8,349.78	+.079	1.74	819	3,783.58	+.089	4.62
Oct.	5,172	10,874.98	+.302	2.10	832	4,584.39	+.21	5.51
Nov.	5,545	11,217.41	+.031	2.02	845	4,425.94	—.034	5.24
Dec.	5,618	12,816.73	+.143	2.28	861	5,450.41	+.23	6.33
1924								
Jan.	5,689	15,291.30	+.193	2.69	877	6,975.52	+.28	7.95
Feb.	5,735	13,372.56	—.125	2.33	892	6,255.50	—.104	7.01
Mar.	5,852	11,893.78	—.11	2.03	907	5,606.90	—.104	6.18
Apr.	5,936	11,260.82	—.53	1.90	948	5,871.16	+.047	6.19
May	6,018	11,138.44	—.011	1.85	951	5,643.90	—.039	5.93
June	6,045	9,650.70	—.133	1.60	960	5,895.07	+.045	6.14
July	6,102	9,162.71	—.051	1.50	970	5,116.77	—.032	5.28
Aug.	6,187	10,133.37	+.106	1.64	981	5,606.33	+.094	5.71
Sept.	6,251	10,802.89	+.066	1.73	992	6,005.47	+.071	6.05
Oct.	6,323	12,353.79	+.144	1.95	1,000	5,850.13	—.023	5.85
Nov.	6,409	14,363.37	+.163	2.24	1,011	7,037.48	+.203	6.96
Dec.	6,495	14,862.79	+.035	2.29	1,021	7,472.19	+.062	7.32
Average	5,717	11,262.00		1.97	915	5,471.16		5.98

+ equals increase.
— equals decrease.
*Cooking consumers in most cases have lighting on same meter with range.

successfully sell the idea of electric cookery to the public we must first demonstrate our sincerity by adopting the electric range and other household appliances.

Very little information is to be had from the manufacturers, jobbers and dealers to arrive at an accurate check of those using ranges but surveys made in several localities showed the percentage to be less than that of the employees of central stations in the same pany.

TABLE III.—Number and percentage of power company employees using electric ranges.

Central station	No. employees using elec. ranges	Per cent employees using elec. ranges	Policy of sale to employees	Terms of payment by employees
Cal. Ore. Pwr. Co.	165	59.5	Cost plus 5%	....
Coast Counties Gas & Elec. Co.	2	1.0	Cost	Cash
Coast Valleys Gas & Elec. Co.	5	7.0	....	....
Desert Pwr. & Water Co.	4	21.0	Cost	Terms
Elko Lamoille Pwr. Co.	4	28.5	....	....
Great Western Pwr. Co.	158	17.5	Cost	Terms
The Nev.-Cal. Pwr. Co	6	....	Cost	....
Ontario Pwr. Co.	12	24.0	Cost	Terms
Pacific Gas and Elec. Co.	*255	3.0	Cost	Terms
San Diego Consol. Gas & Elec. Co.	5	5.0	Cost plus 15%	Terms
San Joaquin Lt. & Pwr. Corp.	85	4.5	....	....
Southern Ariz. Pwr. Co.	5	10.0	Cost	....
Southern Cal. Edison Co.	250	12.5	Cost	Terms
Truckee River Pwr. Co.	4	2.5	Cost	....
Turlock Irrig. District	18	24.0	Cost plus 20%	Terms
Western States Gas & Elec. Co.†	6	20.0	Cost	Terms
Vallejo Elec. Lt. & Pwr. Co.	2	20.0	Cost	Terms
Upper Verde Pub. Util. Co.	2	10.0	....	....
Total	988			

*Approximate.
†Richmond district only.

To improve the situation it is recommended that range manufacturers continue to extend to those in the industry the special discounts established in the past at stated periods. It is further recommended that this saving be passed on to the employee, by all in a position to so handle, with the added inducement of long time payment terms together with the cost of wiring spread over a period of months.

As the chief cause for lack of more universal use of the range by those in the industry is due to the large percentage occupying rented homes, it is suggested that each company work out a system of wiring, having in mind the removal of the same for reuse at some future time with the least possible loss to employee. This, of course, must meet code requirements and local regulations. After the method of wiring is thus determined it will be found that little material will be district. It was possible to obtain some figures from the power companies on this subject. These figures, together with data relative to the sales policy used in selling ranges to employees are given in Table III.

As stated above, the failing, insofar as central station company employees are concerned, is even more pronounced in the manufacturer, jobber and dealer class. In almost every instance shown in Table III the use of electric ranges by employees is encouraged by the power companies by the sale of equipment at cost on terms. In many cases the charge for wiring can be handled on a term basis through the power company. wasted and that labor involved will constitute the major loss. Many employees would be in a position to reduce the labor charges by removing their own wiring upon vacating the premises. With these facts fully understood and the assistance of the company in the matter of terms on the original installation, a great many additional users in the industry should result.

One method suggested calls for screwing conduit containing service wires to the outside of the building without molesting old service; the addition of a switch and cutout in the meter box in such manner as to be easily removed and without including lighting circuits on the same meter with the range. The range circuit from service switch to range can be attached in such a way as to be easily salvaged and connection to range made by means of flexible conduit through the floor to the switch and made fast to the range instead of the wall. This would necessitate metering the range separately from the lighting load. If heavy enough service is run to carry lighting circuits in addition to range, or if one-meter system is desired, the lighting circuits could be cut over to register through a combination meter and wiring could be left so that connections could be replaced in case of the removal of range wiring.

After the adoption of a liberal sales policy and a minimizing of resistance due to wiring expense in rented houses, the problem is by no means solved. A constant sales effort on the part of each company without giving an impression of coercion must be applied. One very productive method is by the introduction of competitive campaigns between departments, cities, divisions, etc., and the interest thereby kept focussed on the issue. A well devised scheme for this purpose with provisions for posting results at frequent intervals is desirable. This same plan should be put into effect on a scale to conform to the smaller organizations of manufacturers, jobbers and dealers.

This committee believes this issue vital to the industry and that the solution, on account of varying circumstances, must remain in the hands of each individual company. Recommendations, therefore, cannot but cover a few general points. Improvement can and should be made, however, and it is strongly urged that serious thought be given the matter and a conscientious effort made to overcome this deficiency as quickly as possible.

Recommendation is made that the incoming range committee continue the study of this problem and report progress made up to the time of their report with further suggestions based upon the conditions as they will have then developed.

Merchandising Ranges

Although less than one-half of the power companies in this section are actively pushing the sale of ranges, all of the larger ones are undertaking the work with plans for greatly increased effort this year. Aggregate results for 1924 are somewhat disappointing, but in those localities where activity was not curtailed the percentage of increase is more satisfactory. Table IV

TABLE IV—Sales acceptance and degree of penetration attained by several companies.

Central Station	Active in range sales	Selling policy	No. ranges per salesman sold monthly—1924	Average monthly sales per salesman expected	Approximate per cent domestic cons. using ranges
Cal. Ore. Pwr. Co.	Through dealers	List	No salesmen	10	13.3
Coast Counties Gas & Elec. Co.	Yes	Cost plus 15%	5	5	01.1
Coast Valleys Gas & Elec. Co.	Yes	....	7	8	02.6
Great Western Pwr. Co.	Yes	Cost plus 20%	8	12	06.3
Los Angeles Gas & Elec. Corp.	No	Do not sell	No salesmen	....	....
Ontario Pwr. Co.	Yes	....	....	15	00.1
Pacific Gas and Elec. Co.	Yes	Cost plus 20%	9.4	12.5	01.8
San Diego Consol. Gas & Elec. Co.	Yes	Cost plus 20%	14	12	01.3
San Joaquin Lt. & Pwr. Co.	Yes	Cost plus 20%	10	10	03.4
Southern Cal. Edison Co.	Yes	....	....	20	02.4
Southern Sierras Pwr. Co.	Yes	Cost plus 26%	10	8	09.7
Truckee River Pwr. Co.	No	Do not sell	None	....	00.5
Turlock Irrig. District	Yes	Cost plus 20%	Entire company-29	Entire company-29	15.8
Vallejo Elec. Lt. & Pwr. Co.	Yes	Cost plus freight and cartage	No salesmen	..	01.6
*Western States Gas & Elec. Co.	Yes	Cost plus 28%	9.8	10	01.6

*Richmond district only

throws some light on the sales resistance encountered in the territories served by some of the larger power companies as well as approximate percentage of domestic consumers using electric ranges.

TABLE V.—Range installation costs—P. C. E. A. companies

Central Station	Average charge for wiring from termination of power company drop to range	By whom installed
Cal. Ore Pwr. Co.	$30 to $45	Contractor-dealer
Coast Counties Gas & Elec. Co.	$54	Contractor-dealer
Coast Valleys Gas & Elec. Co.	$50	Contractor-dealer
Desert Pwr. & Water Co	$45	Contractor-dealer
Flagstaff Elec. Lt. Co.	$15	Not reported
Great Western Pwr. Co.	$35 to $80	Contractor-dealer
Los Angeles Gas & Elec. Corp.	$35	Contractor-dealer
Ontario Pwr. Co.	$20	Contractor-dealer
Pacific Gas and Elec. Co.	$60	Contractor-dealer
San Diego Consol. Gas & Elec. Co.	$35 to $60	Contractor-dealer
San Joaquin Lt. & Pwr. Corp.	$75	Contractor-dealer
Southern Cal. Edison Co.	$50	Contractor-dealer
Southern Sierras Pwr. Co.	$40	Contractor-dealer
Southwestern Ice & Cold Storage Co.	$30	Contractor-dealer
Turlock Irrig. District	$45	Central station
Upper Verde Pub. Util. Co.	$25	Contractor-dealer
Vallejo Elec. Lt. & Pwr. Co.	$45	Central station
Western States Gas & Elec. Co.	$60	Contractor-dealer

Policies of sales adopted in almost every instance call for the sale of ranges at less than list prices and in most cases either for cash or on time (carrying charge is usually added for installment purchases). Many developments of the past year and those under way at present are affecting the sales channels for this product. New ranges have appeared on the market and still others are being developed. Most of these are products of old established stove manufacturers. As a result there has been an awakening on the part of stove houses and retail specialty stores as to the possibilities in this new field.

Practically all central-station companies are making a sincere effort to encourage the contractor-dealer in the sale of ranges. This has resulted in increased dealer activity, but much more intelligent and persistent effort is required along these lines before he will become the important factor in the distribution of electric ranges, to which his position in the merchandising chain would seem to fit him. An undercurrent of activity and interest is prevalent which would seem to indicate that this business will soon be sought by stove houses and retail specialty stores. Immediate consideration and greater activity on the part of the electrical dealer would seem advisable to avoid the diversion of this ever-increasing business from its present channel.

This committee believes the situation now demands a policy of sales at manufacturers' lists, except in certain quantity lots. Such action, because of additional lines, the interest built up and the appreciable increase in unsolicited business noticed, it is believed, will only temporarily retard the volume of sales and will lay a firm foundation for a gradual and permanent upward curve in future range sales.

The slightly greater sales resistance created by an advance in prices will be offset soon by the increased activity on the part of dealers and stove retailers and,

TABLE VI—Range installation for various cities

Central station	Location	Average cost to cons. for wiring ranges	Type of wiring		By whom installed	Street or alley distribution system	Size of carrying wires for range circuit required	Switch requirements at range	Is separate circuit on separate cut-out required?	Type of switch		Average capacity of ranges reported on
			Main service	Range circuit						Main switch	Range switch	
Birmingham Elec. Co.	Birmingham, Ala.	$30	Conduit or K&T	Conduit or K&T	Dealer	Both	100% cap.	None	....	....	....	8 kw.
Southern Cal. Edison Co.	Los Angeles, Cal.	$50	Conduit	Conduit	Dealer	Both	#8 wire	None	Yes	Ext. op.	None	Up to 9 kw.
Great Western Power Co.	San Francisco, Cal.	$80	Conduit	Conduit	Dealer	Street	100% cap.	Yes	Yes	Ext.op.	Ext. op.	7 kw.
Pacific Gas and Elec. Co.	San Francisco, Cal.	$80	Conduit	Conduit	Dealer	Street	100% cap.	Yes	Yes	Ext. op.	Ext. op.	7 kw.
Jefferson County Pwr. and Lt. Co.	Golden, Colo.	$30 to $40	Conduit or K&T	Conduit or K&T	Power company	Both	#6 wire	60-amp.	....	....	....	....
Georgia Ry. & Pwr. Co.	Atlanta, Ga.	$42	Conduit	Conduit	Dealer	Street	100% cap.	Yes	Yes	Ext. op.	Ext. op.	6.5 kw.
Savannah Elec. & Pwr. Co.	Savannah, Ga.	$30	K & T	K & T	Dealer	Alley	100% cap.	Yes	Yes	Ext. op.	Ext. op.	5 kw.
Idaho Pwr. Co.	Boise, Idaho	$32	Conduit	Conduit	company & dealer	Alley	100% cap.	None	Yes	Ext. op.	None	5 kw.
Commonwealth Edison Co.	Chicago, Ill.	$90	Conduit	Conduit	Dealer	Both	100% cap.	Yes	Yes	Ext. op.	Ext. op.	6 kw.
Central Illinois Pub. Service Co.	Springfield, Ill.	$20 to $30	Conduit or K&T	Conduit or K&T	Dealer	Both	#6 wire	None	No	Safety knife	None	....
Wabash Valley Elec. Co.	Clinton, Ind.	$25 to $30	Conduit	Conduit or duplex	Optional	Alley	50-amp. cap.	None	Yes	Ext. op.	None	4 to 7 kw.
Merchants' Heat & Lt. Co.	Indianapolis, Ind.	$60	Conduit or BX	Conduit or BX	Dealer	Alley	100% cap.	Yes	Yes	Ext. op.	Ext. op.	6 kw.
Indiana & Michigan Elec. Co.	South Bend, Ind.	....	Conduit	Conduit	Dealer	Both	100% cap.	None	Yes	Ext. op.	None	6 kw.
United Appliance Co.	Evansville, Ind.	$50	Conduit	Conduit	Dealer	Alley	100% cap.	Yes	Yes	Ext. op.	Ext. op.	7.5 kw.
Iowa Ry. & Lt. Co.	Cedar Rapids, Iowa	$20	Conduit	Conduit	Power company	....	#6 wire	None	....	....	None	8 kw.
Keokuk Elec. Co.	Keokuk, Iowa	$35	Conduit	Conduit	Dealer	Alley	100% cap.	Yes	Yes	Ext. op.	Ext. op.	....
Kansas Gas & Elec. Co.	Wichita, Kan.	$40 to $45	Conduit	Conduit	Both	Both	100% cap.	Yes	Yes	Ext. op.	Ext. op.	Up to 7 kw.
Paducah Elec. Co.	Paducah, Ky.	$50	Conduit	K & T	Dealer	Street	100% cap.	None	No	Ext. op.	None	....
The Edison Elec. Ill. Co. of Boston	Boston, Mass.	$67.50	Conduit	BX	Dealer	Both and underground	100% cap.	Yes	Yes	Either	Either	....
Haverhill Elec. Co.	Haverhill, Mass.	$65	Conduit	Conduit	Dealer	....	#4 wire	Yes	....	Ext. op.	Ext. op.	8 kw.
Consumers Power Co.	Jackson, Mich.	$45	Conduit	K & T	Dealer	Street	100% cap.	None	Yes	Ext. op.	None	7 kw.
Northern States Pwr. Co.	Minneapolis, Minn.	$40	Conduit	Conduit	Dealer	Both	100% cap.	None	Yes	Ext. op.	None	5.5 kw.
Marysville Elec. Lt. & Pwr. Co.	Marysville, Mo.	$20	Conduit	Conduit	Power company	Both	100% cap.	None	Yes	Ext. op.	None	6 to 7 kw.
Union Elec. Lt. & Pwr. Co.	St. Louis, Mo.	$35	Conduit	Conduit	Both	Both	100% cap.	Yes	No	Ext. op.	Snap	Up to 7.5 kw.
Missoula Pub. Service Co.	Missoula, Mont.	$40	Conduit	K & T	Dealer	Alley	100% cap.	None	No	Ext. op.	None	....
Central Power Co.	Grand Island, Neb.	....	Either	Either	Both	Alley	Less than cap	None	Yes	Ext. op.	None	....
Cleveland Elec. Ill. Co.	Cleveland, Ohio	....	Conduit	Either	Dealer	Both	100% cap.	Yes	Yes	Either	Either	....
Union Gas & Elec. Co.	Cincinnati, Ohio	$1 per ft.	Conduit	Conduit	Dealer	Street	100% cap.	None	Yes	Ext. op.	None	7 kw.
Northwestern Elec. Co.	Portland, Ore.	$35	Either	Either	Dealer	Both	100% cap.	None	Yes	Either	None	8 kw.
Portland Elec. Pwr. Co.	Portland, Ore.	$35	Conduit	Conduit	Dealer	Street	100% cap.	None	Yes	Either	None	7.5 kw.
Pennsylvania Pwr. & Lt. Co.	Allentown, Pa.	$90	Conduit	Open	Dealer	Both	100% cap.	Yes	Yes	Ext. op.	Ext. op.	5 kw.
Duquesne Lt. Co.	Pittsburgh, Pa.	$75 to $150	Conduit	Conduit	Dealer	Both and underground	100% cap.	Yes	Yes	Ext. op.	Ext. op.	6 to 7 kw
Scranton Elec. Co.	Scranton, Pa.	$75	Conduit	Conduit	Dealer	Both	100% cap.	Yes	Yes	Ext. op.	Ext. op.	6 kw.
Narragansett Elec. Lt'ng Co.	Providence, R. I.	....	Conduit	Conduit	Dealer	Street	100% cap.	None	Yes	Service box	None	7 kw.
Houston Lt'ng & Pwr. Co.	Houston, Tex.	$23 to $33	Conduit	Conduit	Dealer	Both	100% cap.	Yes	Yes	Ext. op.	Either	7 kw.
Utah Pwr. & Lt. Co.	Salt Lake Cy., Utah	$20 to $50	Conduit	Conduit	Dealer	Both	100% cap.	None	Yes	Ext. op.	None	7 kw.
Virginia Western Pwr. Co.	Clifton Forge, Va.	....	Either	Either	Power company	Street	100% cap.	None	Yes	Ext. op.	None	....
Puget Sound Pwr. & Lt. Co.	Seattle, Wash.	$45	Conduit	Conduit	Dealer	Both	100% cap.	None	Yes	Ext. op.	None	7.5 kw.
City of Seattle	Seattle, Wash.	$40	Conduit	Conduit	Dealer	Both	100% cap.	None	Yes	Ext. op.	None	8.5 kw.
Washington Water Pwr. Co.	Spokane, Wash.	$41.80	Conduit	Conduit	Dealer & company	Both	100% cap.	None	Yes	Either	None	8 kw.
Madison Gas & Elec. Co.	Madison, Wis.	....	Conduit	Conduit	Dealer	Street	75% cap.	None	Yes	Ext. op.	None	....
Wisconsin Pwr. & Lt. Co.	Madison, Wis.	$30	Conduit	Conduit	Power company	Both	100% cap.	Yes	Yes	Safety	Optional	6 to 9 kw.
Natrona Power Co.	Casper, Wyo.	$25 to $35	Conduit	Conduit	Dealer	....	# 8 wire	60-amp.	....	....	....	8 kw.
Sheridan County Elec. Co.	Sheridan, Wyo.	$20	Conduit or BX	Conduit or BX	Power company	Alley	100% cap.	Yes	Yes	Ext. op.	Ext. op.	5 kw.

because of the latitude in merchandising methods a greater margin of profit would permit. Installment sales undoubtedly would increase and certain models would replace in popularity others now generally sold, but the policy would be sound and healthy and create greater sales in the near future.

These recommendations do not presuppose the elimination of the central-station companies from the selling field. In fact, enlargement of the scope of the work and greately increased activity along with the retailing dealers are believed to be necessary. From the standpoint of demand, for the best interests of dealer and power company, it is considered the permanent activity of central-station companies in the sale of all electrical appliances (both lamp-socket and especially wired) is advisable. At least the successful outcome of the proposed policy would depend largely at first on the redoubled effort of the central stations which a list sales policy would support.

Consideration of this important proposed change in the policy of sales by all power companies, dealers and manufacturers is urged with the idea in mind of generally adopting and supporting the plan.

Range Wiring Data

While numerous surveys into the cost of electric ranges indicate the initial selling price does affect sales to a degree, it has been determined that this does not present the obstacle which is created because of the wiring or installation costs incident thereto. Code requirements, stringent in some respects, together with rules put into effect by local authorities have not tended to lessen this burden. The seriousness of this problem cannot be denied and a solution is sought by all interested parties. Table V was prepared from figures furnished by companies in this section as to wiring costs for installing ranges in their territory.

It is recommended that information on load characteristics be gathered at as early a date as possible from the reports as they come out from the Northwest section survey and presented by the incoming range committee to the wiring committee of the N.E.L.A. with request that attempt be made to obtain modification in the present code requirements of the National Board of Fire Underwriters.

The changes in the code recommended by this committee are:

(1) Elimination of Rule 1602 D requiring switch in sight of range (one externally operated switch and fused cut-out at meter location being considered sufficient).

(2) Modification of code to permit use of three No. 8 wires for range circuit on ranges of a capacity to and including 9 kw.

(3) Elimination of Rule 1602 E so as to permit protection of a range and water heater by one set of fuses and one switch.

It is further recommended that local electrical authorities be acquainted with the experiences of other companies where ranges are installed under less stringent regulations with entire satisfaction and safety. It is suggested some relief might be had in most of the cities in this section by gaining permission of local authorities to:

(1) Modify rules to permit knob and tube wiring for ranges in all one family dwellings.

Reports were requested from numerous cities throughout the United States as to wiring costs, method of installation, nature of distribution, etc. Information received from these inquiries is tabulated in Table VI to assist in presenting this matter.

Cost of Electricity for Operating Electric Ranges

Reports indicate that the once all-important point of discussion, i.e., the operating cost of an electric range, while it continues to be brought up, is easy of explanation and does not usually present an obstacle to the sale of the equipment. The reason for this is a greater familiarity on the part of the public occasioned by the increased use of electric ranges.

Since the question continues to be raised, it must be met with more convincing arguments than mere generalities. One company in the southern part of California meets this inquiry with the statement that the average bill per month for 4,000 consumers is $4.59. Another California company has figures showing an average monthly bill per range user of $4.17 for a large number of ranges.

The committee's investigation has revealed a surprising lack of vital statistics pertaining to the cost of operating electric ranges. Those companies successful in the development of this class of business have reported the records of costs of operating the various appliances connected to their lines of the greatest assistance to the sales department. It is strongly urged that a more complete record be kept and made available for the advancement of the business in the future. The dealer is particularly interested and is relying on the power company to supply him this data. A compilation of data as to cost of operation, together with description of equipment, size, number in family, etc., will prove invaluable and worth many times the expense and effort necessary to gather.

Some very salient facts on the cost of operation of electric ranges can be gleaned from Table I. Seventeen of the reporting companies have supplied information as to the average monthly kw-hr. consumption for ranges on their lines. The total number of ranges reported in operation Jan. 1, 1925, on the lines of these seventeen companies is 20,832, and the average monthly kw-hr. consumption per range for this number is 165. At a rate of 3c per kw-hr. this consumption in dollars and cents is $4.95. This is conclusive evidence of the unquestionable practicability of electric cookery from the operating cost standpoint alone without considering the many savings in time, labor, cleanliness and convenience.

Demonstrating and Servicing Ranges

A range is not sold when a customer places his or her signature on the contract, nor yet when it is delivered to the home. A real sale is consummated when the equipment has been connected and placed in use with entire satisfaction. It should be remembered that in changing to an electric range from the use of one using fuel the housewife is apt to feel she is handling a more or less mysterious substance and her methods may prove wasteful unless necessary and simple instructions are given.

An efficient demonstrator should appear in the home as soon as practicable after the range is connected, to familiarize the new user with the essential points necessary to its satisfactory and economical operation. This visit should be followed up at intervals with telephone calls or visits to show the consumer the seller's interest in the success of her new appliance.

As it is natural to recommend the things which are giving satisfaction, it will be found that a prompt and well executed follow-up by a demonstrator is desirable from still another angle. A satisfied and enthusiastic new owner will interest her neighbors and friends more readily than will be the case after the appliance has been in for some time and is looked upon as commonplace. The demonstrator can insure this support in the beginning and its continuance to a degree by periodical calls after the range has been in use for a long time.

Of even greater importance than proper demonstration is the matter of servicing and the policy of providing labor and repair parts for ranges. It is desirable, to further popularize the appliance, that as little burden as possible be placed upon the consumer in the way of charges for labor and parts used. Prompt and efficient maintenance work is necessary to prevent an antagonistic impression toward the equipment should it become inoperative.

A study of this subject has caused this committee to arrive at the conclusion that the further popularization of the range demands a liberal policy of service by the central station supplying electricity therefor, as well as full cooperation in this regard from the dealer who makes the sale and the manufacturer whose product is sold. The practice generally used is endorsed and its continuance, while the development is in its present stage, recommended. This policy of service supplies to the consumer free of charge, during the first year, all parts (parts for first year supplied under manufacturer's guarantee) and labor involved for ordinary outages. After expiration of guarantee period labor continues to be furnished without charge but repair parts required are charged at power company's cost or cost plus a small percentage for handling. Encouragement for the dealer is provided in this manner also by removing from him most of the burden of service.

Commercial Electric Cookery

In considering the subject of electric heavy duty cooking and baking equipment, manufacturer, jobber, central station and dealer were found to be interested

parties to the development of this business. A study of the matter from the angle of any of these agents brings forth many interesting facts and figures. One fact outstanding is that heavy duty equipment, similar to most other large power consuming devices, depends upon the central station primarily for the activity which causes the desired movements from the manufacturer to the consumer. If such sales have not been progressing as energetically as might be hoped then it remains necessary to show that this class of load is desirable for the power company. It is presumed, of course, that the central-station company's activities will not cover the actual merchandising of this equipment but will assist in its promotion through dealers and other retail outlets. The margin of profit is relatively small and dealer could not afford to handle the business unless fully protected.

TABLE VII—Heavy duty ranges reported in use on lines of companies in this section.

Central station	Connected Jan. 1, 1925	Connected Jan. 1, 1924	Percentage of increase	Average monthly kw-hr. consumption per range	Average monthly revenue per range
Cal. Ore. Pwr. Co.......	17	11	54.5	3,833	$50.60
Great Western Pwr. Co.	11	5	120.0	2,600	52.00
Pacific Gas and Elec. Co.	3	3	0	1,833	31.10
San Diego Consol. Gas & Elec. Co.............	1	1	0	3,500	90.00
San Joaquin Lt. & Pwr. Corp................	4	4	0	8,000	123.75
Southern Cal Edison Co.	No record	No record	....	....	....
Turlock Irrig. district..	2	....	....	1,700	18.00

The industrial application of electrical energy represents a very great field and in this classification few applications are so profitable and attractive as the heavy duty cooking and baking load. It has been estimated that if all fuel equipment in use in the United States were to be replaced by electric heavy duty equipment, the central stations would be called upon to furnish approximately 12,500,000 kw-hr. additional per day. On the other hand, if 15 per cent of all fuel installations were converted to electric, within five years the sales would be increased about 2,000,000 kw-hr. per day. Table VII shows the little progress made in this direction.

The field for the use of heavy duty electric equipment includes bakeries, hotels, restaurants, cafeterias, lunch rooms, tea rooms, hospitals, schools, clubs, ships, Y.M.C.A.'s, Y.W.C.A.'s, apartment hotels, industrial plants, penal institutions, U. S. government ports, etc. With the exception of new installations, these various prospects have equipment which will be partly or entirely replaced in the next several years.

Of all heavy duty equipment the bake oven, being the oldest, is perhaps best known and most generally used. While it is known there are considerably more heavy duty ranges in use than those reported in Table VII, several ranges are used in Yosemite Valley and by commercial companies generating their own electricity, a considerably larger number of bake ovens are to be found.

An interesting report covering a survey of fifty installations of various units of equipment ranging from a 3-kw. griddle to an 80-kw. bake oven showed the following facts:

Merchandise sales price of equipment	$85,320	
Jobbers' profit	8,532	
Merchandise profit	12,789	
Electric contractor received for material and labor	14,580	
Connected load of equipment		1,854 kw.
Average load demand		863 kw.
Cost to central station for line service, transformers and meters	14,650	
Annual income to central station for current consumed	42,000	

A check of installations showed that equipment operated at a 70 per cent off-peak load.

The bake oven load operates 8 hours per day on an average and often operates 16 to 18 hours in each 24. The off-peak characteristics of this load are manifest, especially in the case of a combined cooking and baking load on a rate where regulated demand tends to reduce the consumer's bill. Ranges, broilers, griddles, waffle irons, egg broilers, steam tables, coffee urns and various special devices are often found in a combined installation with bake ovens. Actual surveys have developed that the power factor is often as high as 70 per cent and that the operating demand averages from 50 to 70 per cent of the connected load.

Dealers almost generally state the margin of profit on most lines of heavy duty equipment is far too little and that the price at which it is being retailed is out of line when compared with fuel-consuming equipment designed for the same purpose.

Testimonials from users agree that the electric equipment is superior for the following reasons: cleanliness; produces uniformly better products; affords improved working conditions; requires less attendance; requires less floor space; results in less shrinkage of food; means less spoilage and far more convenience.

The Growing Importance of Electric Air Heating

Report of Electric Air Heating Committee, Electric Cooking and Heating Bureau, Commercial Section*

THE use of electricity for the heating of air is being rapidly extended. A check of the sales of electric heater manufacturers reveals this fact. Salesmanship alone is not responsible. If there were no merit to this method of heating, sales would decline as knowledge of its defects became known.

The heating of air by this means is of growing importance, let us consider its advantages from the standpoints of both users and the central stations. To be successful, it must prove a source of real benefit to the user and of ultimate profit to the companies supplying the necessary energy. Much information is already available on this subject. That there are hundreds of users of this form of electric service who are thoroughly pleased with it, and that certain power companies have proved the load to be desirable cannot be denied by anyone that is fully informed.

Local conditions, including climate, prevailing temperatures, generating and distributing costs, habits of the users, etc., have a broad influence on the growth of the business.

The colder winter climate of the Middle West and Eastern states is less favorable to the use of electric heat than the milder climate of the Southern and Pacific Coast states. Sections enjoying low steam generating costs or favorable water power developments where costs of generation, transmission, and distribution of current are not excessive are in better position to benefit from the service than those less fortunately situated. It is not strange, therefore, that electric air heating has had its inception and enjoyed its most rapid expansion on the Pacific Coast. It has been proved in a number of instances that its profitable use is not limited to that section of the country.

Any well constructed building can be comfortably heated with electricity regardless of its location or the prevailing temperatures. Decision regarding its use must be based on a comparison between its relative advantages and cost on one side and cost of fuel on the other. There are electric service customers in every community who are able and anxious to use electric heat even where the cost has been found to be very much higher than fuel.

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With these facts in view, the following paper was prepared to show:

1. The advantages of electric heat to the user.
2. A method of estimating the size of heaters required for different types of buildings.
3. A method of calculating energy consumption.
4. Some actual data on energy uses in existing installations.

Advantages of Electric Heat

Some of the features of this form of heating which carry a strong appeal to the user may be outlined as follows:

Healthfulness: It does not vitiate the atmosphere either by burning up the oxygen in the air or by throwing off poisonous fumes.

Cleanliness: No smoke, soot, grease, dirt, moisture or disagreeable odors are given off because no combustion takes place.

Convenience: No fuel or ashes have to be stored or handled. No fires have to be lighted or otherwise tended. Temperature may be controlled manually or automatically. Heaters may be moved from place to place or permanently mounted where they render the best service. Heat is instantly available without the delay commonly experienced with steam, hot water and other heating systems. Only such portions of the building that are occupied need be heated.

Safety: When heaters have been designed to pass the inspection of the National Board of Fire Underwriters and have been installed properly there is no danger of fires, explosions or poisonous fumes.

The following are a few of the types of installations which are proving successful:

All Electric Homes: Due to the cost and difficulty of obtaining competent servants, many families in modest circumstances make their homes of from five to eight rooms all electric, including lighting, cooking, water-heating, air-heating and appliances. In such cases the housewife can readily do the daily tasks herself without great exertion. The total yearly cost for such electrically equipped homes averages from $175 to $325 per year where the temperature does not go below 20 deg. F. and electricity is available at an average rate not exceeding 2½c per kw-hr. This amount is well within the range of a large class of people, when the saving in other ways is taken into consideration.

All Electric Apartments: Apartment house owners have come to realize the advantage of electric heating which eliminates the services of a janitor and the necessity of operating a central heating system continually for the convenience of a few tenants who might require almost constant heat. Electric heat is available to each tenant at any hour that they might require it, with the advantage of just paying for the amount which they need. Energy for these apartments is usually purchased on a master meter and resold to the tenant on a sub-meter. In this way a low average rate is earned. Some apartment house owners sell for a lower rate than that which they pay but are justified in doing so inasmuch as all attendant and repair charges are eliminated.

Hotels: A number of hotels have been equipped electrically with the result that they are giving entire satisfaction where a sufficient capacity of the proper kind of heaters has been installed to take care of the radiation losses of the building. It is usual in making an installation in a hotel to install the distribution panel controlling each heater in the office so that the clerk in charge can turn on the heater as soon as the room has been let. The heater is then operating by the time the occupant arrives in the room. The switch can also be pulled when the key is returned to the desk if so desired.

Schools: Safety and automatic temperature control are very important factors in school work. Schools are heated but a few hours per day and five days per week, with many holidays and vacation periods resulting in low operating costs as janitors are not required for the operation of electric heating systems. Oftentimes members of the staff wish to spend extra time after school hours and holidays. In these cases they can heat the individual room which they are occupying without the necessity of operating the entire plant. The initial cost of electric heating systems in this type of building is usually much lower than that of other heating systems. This is an added feature as money for school buildings is not readily available. In one instance the saving in the installation alone was sufficient to pay the cost of electrical energy for a period of 10 years, not taking into consideration interest on investment, cost of fuel, janitor service and depreciation of plant.

Churches: Buildings of this description require heat but a few hours per month with the result that they must have a system which will quickly heat the whole or any portion of the building. The low cost and flexibility of electric heating systems are particularly adapted to this class of building.

Offices: Employers are recognizing the advantage of supplying proper heating systems to their employees. Electric heating systems can be regulated uniformly to the temperature where employees work to the highest efficiency. Pure air with uniform heat and proper ventilation without drafts will increase office efficiency from 10 to 25 per cent.

Calculation of Heat Capacities

In making calculations as to the size of heaters required to create and maintain proper temperatures, the following must be considered:

1. Area of exposed glass.
2. Area, construction and exposure of outside walls.
3. Area, construction of inside walls and temperature of adjoining rooms.
4. Area, construction of floor and conditions under floor.
5. Area, construction of ceiling and whether attic or floor above.
6. Volume of air in room and number air changes required per hour.
7. A study of air leakage should be made as this increases the number of air changes.

High temperature radiant reflector type heaters primarily are adapted to heating limited areas rather than for uniformly raising the room temperature and as the calculations for that type of heating are entirely different from those involved in heating by convection air currents. The following discussion is limited to the subject of convection air heating only.

As the majority of electric heaters are rated in watts all radiation losses will be given in watts rather than in B.t.u. One watt-hour is equivalent to 3.412 B.t.u.

Table I computed from reliable sources gives the watts lost by radiation per sq. ft. of surface of different building materials for each 10 deg. F. difference in temperature between that of the room to be heated and the surrounding air.

To calculate the volume of air, multiply the cubical contents of the room by the number of air changes required per hour.

In residences it is customary to calculate one change of air per hour but where there are many leaks around doors and windows this should be increased to two.

In schools, churches, theaters, halls, shops, etc., the law requires 30 cu. ft. of fresh air per minute per person, but as each occupant of the room gives off a certain amount of heat, it is only necessary to figure on the heating of from two to four changes per hour according to the number occupying the room.

Where sides of buildings are exposed to winds 10 to 25 per cent should be added to the radiation losses of the surfaces exposed. Sides exposed to winds are no colder than those not exposed but due to wind pressure the air leakage is greater thus increasing the air changes.

When buildings are only heated intermittently with long intervals of non-heating, capacity of heaters should be increased at least 10 per cent. Never install under-capacity heaters as over-capacity heaters will ensure greater economy and more satisfactory service.

The following example indicates the method of determining the size of heaters for different types of buildings:

Method Used

Living room 14 x 30 ft. with 9 ft. ceiling, having two outside walls, 20 ft. wall exposed to winds. Glass area 75 sq. ft. Frame construction, plastered inside, boarded and plastered outside. Double wood floor, plastered ceiling, no floor above. One air change per hour. Difference between outside and required room temperature 30 deg. F.

Refer to Table I under 30 deg. F. temperature difference in order to determine the watts lost per sq. ft. for each particular surface.

The following gives the method of making calculations:

Glass area..........× watts lost per sq. ft. =
Outside wall (less glass area)......× watts lost per sq. ft. =
Inside wall area..........× watts lost per sq. ft. =
Floor area..........× watts lost per sq. ft. =
Ceiling area..........× watts lost per sq. ft. =
Volume room × air changes per hour × watts required per cu. ft. ....=
Allowance for exposed areas..........=

Total watts required..........=

Example 1

Surface	Area sq. ft.	Watts Lost Per sq. ft.	Total Watts Lost
Glass	75	× 9	675
Outside wall	(14 ÷ 20) × 9—75	× 3.9	900.9
Inside wall	(14 ÷ 20) × 9	× 1.2	367.2
Floor	(14 × 20)	× .75	210
Ceiling	(14 × 20)	× 3	840
Air	(14 × 20 × 9 × 1	× .162	408.24
Exposed area	(20 × 9) × .25	× 3.9	175.5
Total watts required			3,576.84

It will be noted that the watts required in this room are 1.42 per cu. ft.

In making the calculations for residence heating each room should be figured separately. However for quick estimating it is safe to figure .5 watts capacity for each 10 deg. F. difference in temperature between room and outside air. This rule does not hold true, however, under abnormal conditions or where the volume is less than 1,000 or greater than 5,000 cu. ft. As the volume increases the watts required per cu. ft. will become less. This is due to the radiating surface not being increased in direct proportion to the volume.

Applying this rule to a normal room (14 x 14 x 9 ft.) with a temperature difference of 40 deg. F. it would require 2 watts per cu. ft. or a total of 3,528 watts.

Example 2

Office Building: 40 x 60 ft. four stories high, 12 ft. high between floors, four outside walls, construction 12 in. concrete. Glass area 4,000 sq. ft., first floor wood on concrete, composition roof with plastered ceiling, two air changes required per hour, temperature difference between outside and inside room temperature 40 deg. F.

Note: In calculating the heat required for office buildings only the first story floor and upper story ceiling are taken into consideration. All partitions are also neglected as it is customary to heat the entire building at one time.

Refer to Table I in order to get the radiation losses for 40 deg. F. temperature difference.

Surface	Area	Watts Lost per sq. ft.		Total Watts Lost
Glass	4,000	× 12	=	48,000
Outside wall (less glass)	5,600	× 4.4	=	24,640
First story floor	2,400	× 1.6	=	3,840
Upper story ceiling	2,400	× 4.0	=	9,600
Air	115,200 × 2	× .216	=	49,766
Total watts required				135,846

In order to determine the capacity of the heaters required for the second and third floors, subtract the radiation losses of the first story floor and the fourth story ceiling from the total and then divide by the number of floors, as follows:

Total capacity of heaters in watts		135,846
Less radiation loss first story floor	3,840	
Radiation loss fourth story ceiling	9,600	13,440
Capacity to be divided equally between four floors		= 122,406
Capacity of heaters required for second and third floors		30,601.5 watts
Capacity of heaters required for first floor		34,441.5 watts
Capacity of heaters required for fourth floor		40,201.5 watts

The size of heater for each office can then be proportioned according to the size of office. Allowance should be made for extra radiation losses in corner offices. It is always good practice to check a few offices separately, but in so doing all partitions can be neglected.

It is often necessary to compare electric heater sizes with those of steam or hot water radiators for the same building and while it is a known fact that radiators vary according to construction, surface of heater and pressure the following will give a fair average:

1 sq. ft. of steam radiation at 4 lb. pressure..........= 70 watts
1 sq. ft. of steam radiation at 10 lb. pressure..........= 80 watts
1 sq. ft. of hot water radiation at 180 deg. F..........= 45 watts

Method of Calculating Energy Consumption

The records of the nearest weather bureau will give the hourly temperature for the year. For rough calculations the mean monthly temperatures during each of the heating months as averages over several years, may be taken. To estimate the consumption for any month, subtract this mean temperature from the desired temperature and divide by the maximum temperature rise figured for the heater. Multiply the heater size by this factor and by the number of hours required to heat.

As an example, an installation is figured to give 40 deg. F. temperature rise (30 deg. F. to 70 deg. F.) and the mean temperature for a given month is found to be 50 deg. F. The average temperature rise is then 20 deg. F. (70 deg. F—50 deg. F.). If a 5-kw. heater adequate to give a 40 deg. F. temperature rise was installed in a room and the room was heated daily for 8 hours per day 25 days per month, the consumption would be:

TABLE I

Nature of Surface	Watts lost per sq. ft. of surface for varying temperature difference expressed in degrees F. 10 deg.	20 deg.	30 deg.	40 deg.	50 deg.	60 deg.	70 deg.
Single glass	3.0	6.0	9.0	12.0	15.0	18.0	21.0
Double glass	1.7	3.4	5.1	6.8	8.5	10.2	11.9
Single skylight	3.5	7.0	10.5	14.0	17.5	21.0	24.5
Double skylight	1.8	3.6	5.4	7.2	9.0	10.8	12.6
8-in. Brick wall	1.3	2.6	3.9	5.2	6.5	7.8	9.1
12-in. Brick wall	.9	1.8	2.7	3.6	4.5	5.4	6.3
24-in. Brick wall	.6	1.2	1.8	2.4	3.0	3.6	4.2
8-in. Concrete wall	1.6	3.2	4.8	6.4	8.0	9.6	11.2
12-in. Concrete wall	1.1	2.2	3.3	4.4	5.5	6.6	7.7
24-in. Concrete wall	.7	1.4	2.1	2.8	3.5	4.2	4.9
4-in. Hollow tile, plaster both sides	1.5	3.0	4.5	6.0	7.5	9.0	10.5
8-in. Hollow tile, plaster both sides	1.2	2.4	3.6	4.8	6.0	7.2	8.4
12-in. Hollow tile, plaster both sides	1.0	2.0	3.0	4.0	5.0	6.0	7.0
Frame wall, plaster outside	1.3	2.6	3.9	5.2	6.5	7.8	9.1
Frame wall, double board outside	1.0	2.0	3.0	4.0	5.0	6.0	7.0
Partition, Lath and plaster one side	1.2	2.4	3.6	4.8	6.0	7.2	8.4
Partition, Lath and plaster both sides	2.0	4.0	6.0	8.0	10.0	12.0	14.0
Partition, 1-in. wood	1.8	3.6	5.4	7.2	9.0	10.8	12.6
Partition, 2-in. wood	1.2	2.4	3.6	4.8	6.0	7.2	8.4
Wooden floor, double board	.25	.5	.75	1.0	1.25	1.5	1.75
Concrete floor	.9	1.8	2.7	3.6	4.5	5.4	6.3
Wooden floor on concrete	.4	.8	1.2	1.6	2.0	2.4	2.8
Dirt floor	.6	1.2	1.8	2.4	3.0	3.6	4.2
Plaster ceiling, no floor above	1.0	2.0	3.0	4.0	5.0	6.0	7.0
Plaster ceiling, floor above	.75	1.5	2.25	3.0	3.75	4.5	5.25
Wooden ceiling, composition roof	.9	1.8	2.7	3.6	4.5	5.4	6.3
Watts per cu. ft. of air required to heat air	.054	.108	.162	.216	.27	.324	.378

$$5 \text{ (Kw.)} \times \frac{20}{40} \text{ (factor)} \times 8 \text{ (hrs.)} \times 25 \text{ (days)} = 500 \text{ kw-hr.}$$

The result, however, obtained in this manner would be high as the mean temperature taken above is the mean for the 24-hr. period and the mean for the heating period would be higher as it is warmer during the heating hours than the average for both day and night. Allowance must also be made for heat derived from the sun, which is of great importance.

It is impossible to make an accurate calculation of the monthly consumption of any particular building due to the variation in construction, temperature and heating requirements, but from a close observation of several installations in the San Francisco Bay section, which have been installed for some time and on which very accurate data have been compiled, it has been found that the following are very fair averages:

In each of the following installations heaters of sufficient capacity to maintain a temperature difference of 30 deg. F. between outside and inside room temperature were installed.

Residences: Consumption per month for six winter months where a uniform temperature was maintained, average 20 to 25 kw-hr. per kw. of heater capacity installed.

Offices: Consumption per month for six winter months heating eight hours per day, 26 days per month, average 50 to 60 kw-hr. per kw. of heater capacity installed.

Schools: Consumption per month for six winter months heating five hours per day, 21 days per month, average 35 to 40 kw-hr. per kw. of heater capacity installed.

TABLE II—Homes

	Los Gatos 6 rooms kw. installed	San Francisco 6 rooms kw. installed	San Francisco 6 rooms kw. installed	San Mateo 7 rooms kw. installed	San Francisco 7 rooms kw. installed	Belvedere 7 rooms kw. installed	San Francisco 8 rooms kw. installed	San Francisco 8 rooms kw. installed	San Francisco 8 rooms kw. installed
Range	7	7	8	8	7	8	12.5	7	7
Water heater	5	5	5	5	5	5	5	5	5
Air heaters	21	18.5	18	26.2	19.2	24	34	28	30
Lights and appliances	2	2	2	2.5	2.5	3	3	2.5	3
	kw-hr. consumed	kw-hr. consumed	kw-hr. consumed	kw-hr. consumed	kw-hr. consumed	kw-hr. consumed	kw-hr. consumed	kw-hr. consumed	kw-hr. consumed
Jan. 1925	1,540	1,860	1,306	2,756	1,640	1,855	2,560	3,946	2,688
Feb. 1925	1,420	1,196	958	2,430	1,290	1,771	1,504	2,502	1,952
Mar. 1924	1,490	930	900	1,681	920	1,517	1,184	1,018	1,920
Apr. 1924	1,000	1,142	1,100	1,769	1,110	864	1,664	1,167	1,664
May 1924	560	847	1,118	1,317	910	872	1,152	892	1,216
June 1924	340	885	563	1,207	910	630	960	936	1,184
July 1924	180	898	187	903	822	600	832	458	736
Aug. 1924	590	735	686	739	420	660	704	77	399
Sept. 1924	500	493	955	951	470	708	768	385	640
Oct. 1924	460	814	730	974	780	449	864	760	800
Nov. 1924	660	858	1,097	1,771	915	779	1,216	1,242	992
Dec. 1924	870	1,038	1,353	1,523	1,205	1,424	1,246	1,716	1,312
Total	9,620	11,696	10,953	18,021	11,392	12,129	14,554	15,099	15,503
Estimated consumption for cooking, water heating and lighting	5,520	5,520	5,520	8,400	5,400	6,000	8,400	8,400	8,400
Air heating only	4,100	6,176	5,433	9,621	5,992	6,129	6,154	6,699	7,103
Average per month	342	515	453	802	499	511	513	558	592

Do not attempt to compare the operating cost of electric heating systems with those of other heating systems by means of the B.t.u. given off by combustion of other fuels, as it is an unfair comparison due to the fact that the efficiency of other systems can only be estimated and are usually compared under ideal conditions which do not prove correct under actual tests over long operating periods, furthermore this efficiency decreases as plants are operated at less than full load. The only proper comparisons are derived from the results of satisfactory installations.

In determining the actual annual cost of any heating system the following must be taken into consideration:

1. Interest on initial investment.
2. Insurance on plant.
3. Depreciation of plant.
4. Labor required to operate plant.
5. Repairs necessary to keep plant operating.
6. Cost of fire proof room and necessary flues.
7. Actual cost of fuel.

The flexibility of electric heating systems which permit of the heating of any particular room without the necessity of operating the entire system, also the ease with which the heat can be regulated, must be given careful consideration.

Some Actual Data on Energy Uses in Existing Installations

Tables II to VI present the kw-hr. consumption of a number of homes, apartments, offices, and banks using electricity exclusively for cooking, water heating, air heating, lighting and appliances.

Insulation: Careful consideration should be given to proper insulation of floors, ceilings and walls of buildings, also to air leakage around windows, doors, etc. Improper insulation and drafty rooms will increase the operating cost of any heating system from 25 to 50 per cent. The cost of properly insulating a building compared to the initial cost is so small that it is usually absorbed by the difference of the heating bills in the first year of operation.

Exposed Glass: It has been found from actual installations which have large glass areas that when such areas are on the sunny side of the building that they aid in the heating of the building rather than add to the operating cost. The radiation losses are however greater on dull days but these losses are more than compensated for when the sun is shining. In figuring buildings of this type be sure to note position of building.

Ventilation: Although it appears to be the general custom to ventilate rooms from the ceiling or by opening windows, it is the most costly and unsatisfactory means of properly ventilating. Hot air being lighter than cold air rises and is carried to the outside atmosphere while foul air is heavier than fresh air and falls to floor level. It is not always a simple matter to ventilate rooms from the floor without mechanical means. The cost however is much less by using the electric energy to drive an exhaust fan for this purpose than to use hot air to create the draft.

Location of Heaters: Heaters should be placed in such a manner as to cause air currents to move away from windows rather than toward them. Very satisfactory results are obtained by locating heaters below the windows. Wall or bracket type heaters should be placed as close to the floor as possible. Long or large rooms should be provided with two or more heaters located as far apart as convenient. It is obvious that better heat distribution is realized from two heaters than from a single one.

TABLE III—Apartments

	San Francisco 16 rooms kw. installed	San Francisco 42 rooms kw. installed	San Francisco 79 rooms kw. installed
Ranges	4 - 7 kw.=28	15 - 7 kw.=105	33 - 6½ kw.=214.5
Water Heaters	20	10	*
Air Heaters	23	110	137
	kw-hr. consumed	kw-hr. consumed	kw-hr. consumed
Jan.	3,171	15,280	13,440
Feb.	2,945	11,120	10,920
Mar.	2,309	10,160	6,000
Apr.	1,930	10,720	6,240
May	1,585	9,120	5,160
June	1,250	8,320	4,680
July	1,163	8,720	5,400
Aug.	1,187	8,380	1,440
Sept.	1,222	8,000	3,120
Oct.	1,271	7,690	2,760
Nov.	1,671	9,880	7,720
Dec.	1,836	14,590	12,320
Total	21,540	121,980	79,200
Estimated consumption cooking and water heating	8,640	93,000	†31,680
Heating only	12,900	28,980	47,520
Average per month	1,075	2,415	3,960
Average per room per month	67	58	50

*Separate meter. †Cooking only.

TABLE IV—Offices

	San Francisco	San Francisco	San Francisco
Kw. installed for air heating	10.8	20	27
	kw-hr. consumed	kw-hr. consumed	kw-hr. consumed
Jan.	1,542	3,270	3,408
Feb.	843	2,296	2,448
Mar.	668	1,032	792
Apr.	384	1,361	984
May	118	1,039	168
June	6	89	264
July	7	69	48
Aug.	76	198	288
Sept.	18	259	120
Oct.	103	536	24
Nov.	551	1,403	576
Dec.	1,150	1,458	1,968
Total	5,466	13,010	11,088
Average per month	455	1,084	924
Average per kw. connected per month	42	54	34

Humidity: This is a very important factor in the East and Middle West where the temperature is around zero and the percentage of moisture in the air is low. However, on the Pacific Coast during the heating period the percentage of moisture in the outside air is high and as the difference in temperature is not great, the outside air when brought up to room temperature usually contains sufficient percentage of moisture so that it is not necessary to add any.

TABLE V—Banks

	Oakland	Santa Rosa	San Leandro	Sausalito
Kw. installed for air heating	24.4	12.6	31.8	43
	kw-hr. consumed	kw-hr. consumed	kw-hr. consumed	kw-hr. consumed
Jan. 1925	2,558	2,705	2,970	5,000
Feb. 1925	1,672	2,544	2,670	5,300
Mar. 1924	650	1,277	1,350	3,175
Apr. 1924	883	700	.....	.....
May 1924	164	100	.....	.....
June 1924	219	118	.....	.....
July 1924	59	60	.....	.....
Aug. 1924	108	.....	.....	.....
Sept. 1924	62	.....	.....	.....
Oct. 1924	118	39	30	75
Nov. 1924	792	638	600	1,875
Dec. 1924	1,951	1,200	1,230	3,050
Total	9,216	9,381	*8,850	*18,475
Average per month	768	782	†1,475	†3,079

*For six months.
†Per six months.

TABLE VI—Automobile Show Room and Offices

	San Francisco	San Francisco	San Francisco
Kw. installed for air heating	15.8	66.6	177.9
	kw-hr. consumed	kw-hr. consumed	kw-hr. consumed
Jan. 1925	3,289	8,040	*23,040
Feb. 1925	2,550	*9,000	*23,040
Mar. 1924	1,691	4,560	5,760
Apr. 1924	2,394	4,260	6,120
May 1924	1,089	1,440	3,600
June 1924	573	1,200	1,680
July 1924	170	240	†1,800
Aug. 1924	307	360	†2,400
Sept. 1924	287	720	†1,200
Oct. 1924	864	420	†1,920
Nov. 1924	2,035	1,560	†3,360
Dec. 1924	2,723	3,300	†3,960
Total	17,972	35,100	77,880
Average per month	1,496	2,917	6,490

*1924
†1923

Stimulating Interest in Better Farm Lighting

Report of the Cooperative Farm Lighting Committee, Lighting Bureau, Commercial Section*

UPON the completion of its activities in the other lighting fields for the current association year, the Lighting Bureau turned its attention to the rural lighting situation. As a result, the Cooperative Farm Lighting Committee was appointed in September of 1924 for the purpose of stimulating interest among rural consumers in better farm lighting and especially in the better lighting of the rural home. It was further decided at this time that the work of the committee was to be cooperative throughout with the concurrent campaign of similar bodies.

To avoid a duplication of effort, our plans were constructed around the work being carried on in this field by the California Committee on the Relation of Electricity to Agriculture and by the Division of Agricultural Extension of the University of California.

A preliminary survey was made by the committee to ascertain the scope of the field, and, from the data secured, it was very forcibly shown that our efforts must be guided by two major premises.

1. The majority of rural homes are, on an average, very poorly lighted.
2. The utilization of electricity in the lighting of farm yards and buildings is practically negligible.

An investigation was made to determine the reason for the existence of these conditions. From the majority of cases it was found that the main reason lay in the fact that rural consumers, as a class, have not been educated either to the means of obtaining adequate light or to the hygienic methods of controlling it.

The existence of this condition is not the fault of the rural consumer, but is, rather, the fault of the industry. This agency which could have eliminated the problem at its source has consistently neglected farm lighting, probably because it was, at the same time, magnifying farm power beyond the point of its relative importance.

In order to extend its effectiveness in coping with the existing erroneous custom, the committee desired to stimulate interest directly among the rural consumers themselves through the medium of comprehensive lighting demonstrations, to be carried on in cooperation with the central stations.

After very carefully considering all the ways by which the demonstration could be most effectively made, we agreed that the farm lighting exhibit given by the Division of Agricultural Extension of the University of California was the best vehicle for the work.

An attempt was made to join with the University of California in a purely non-commercial manner toward the furtherance of the university's splendid work. However, on account of certain unalterable university rules, the authorities could not accept our offer of cooperation. The Extension Division appreciates the interest we have taken in its rural lighting activities and desires that our association be apprised of its regret that our activities cannot be carried on jointly.

The committee, therefore, must now devise a means of its own for carrying a proper understanding of lighting principles and practice to our rural consumers. We are firm in our belief that a portable exhibit that may be transported throughout the rural territory is the most effective medium for accomplishing this end. The field is so large that a duplication of effort is hardly probable. For the committee's purpose the University of California exhibit could be duplicated, or modified to fit local conditions, and, with a firm basis of cooperation between the association and the central stations, the message of better farm lighting can be spread throughout the rural districts to the mutual advantage of all concerned.

This matter is now receiving the attention of the committee and a supplemental report will be filed as soon as due consideration has been given to the subject.

*N. R. Sutherland, Pacific Gas and Electric Company, chairman; H. E. Cook, Edison Lamp Works; W. C. McWhinney, Southern California Edison Company; L. J. Nevraumont, Pacific Gas and Electric Company.

Teaching the Fundamentals of Better Lighting

Report of the Lighting Schools Subcommittee, Lighting Bureau, Commercial Section.*

A report covering the activities of this committee, which consisted mainly of the conducting of two lighting schools, one in Los Angeles and the other in Oakland, was presented in the April 15, 1925 issue of the Journal of Electricity, p. 284. Complete information concerning the methods of conducting these schools was presented in the article, and it is not considered necessary to repeat the report here.

It is sufficient to state that the two schools drew an attendance of 103 men vitally interested in better illumination and that the organization of a permanent lighting school has been suggested to the committee. The schools were designed to give information of an elementary nature and the suggestion has been made that secondary schools be conducted to supplement the work of the first schools.

*Clark Baker, National Lamp Works, chairman; H. H. Allison, Electric Appliance Company, vice-chairman.

Following Up the National Better Home Lighting Contest

Report of the Home Lighting Follow-Up Subcommittee, Lighting Bureau, Commercial Section*

IN order that some definite picture may be had of the basis upon which it was planned that this committee might work, the final results in Region 12 of the Better Home Lighting Contest are presented.

Number of towns participating	243
Number of eligible school children	232,676
Number of Primers actually distributed	67,696
Number of signed registration cards received	26,769
Number of final entries submitted	4,646

NOTE: From these figures it will be observed that 29 per cent of the eligible school children of this region actually received primers and commenced work in the contest; and that 7 per cent of the primers distributed were returned completed to the committee. This figure does not represent the entire number of entrants who carried their work through to completion, as in many cases where the work was conducted as part of the school course the teachers graded the entries themselves and only turned over the best to the committee.

Two meetings of the Better Home Lighting Contest Committee of the Pacific Coast Electrical Association have been held. One in Los Angeles on Oct. 17, 1924, the other in San Rafael, on Nov. 19, 1924, the latter being a joint meeting with the Lighting Bureau of the National Electric Light Association.

Recognizing that the follow-up of such a strictly non-commercial activity as was the Better Home Lighting Contest rested largely in the hands of individual companies, and that there were very severe instructions upon the possible follow-up by such a neutral organization as the Pacific Coast Electrical Association, the personnel of this committee was extended to twelve members in order that the committee meetings might serve as a forum for the interchange of ideas which the individual companies represented might put into practice.

$50 More for You

In addition to the prizes which your company is offering in the Home Lighting Contest for Central Station Employees, and the $1000 in prizes which the National Electric Light Association is offering, the LIGHTING BUREAU of the PACIFIC COAST ELECTRICAL ASSOCIATION now announces $50 for the best entry from California, Nevada and Arizona.

If you are the winner of one of the prizes your company is offering, your entry will be eligible for the P. C. E. A. prize, and also for the N. E. L. A. prizes.

This contest combines two excellent opportunities:

OPPORTUNITY A:- It is a great chance for you to get the very latest information concerning developments in one of the most important phases of your company's business.

OPPORTUNITY B:- It is an equally great chance to make your spare time pay dividends. Someone is going to spend two or three evenings of enjoyable work in this contest and win $575.

If you aren't already taking part get going right away. Make up your mind to be the "Someone" who will

WIN $575

Poster used by the Lighting Bureau to announce the P.C.E.A. prize for the Power Companies' Employees Home Lighting Contest

The committee has been advised that the Primers submitted by thirty-four school children in Region 12 were of such excellence as to warrant the awarding of special mention in addition to the regular list of prizes offered by the National Better Home Lighting Committee. Bronze medals have been made for these children and will be sent to them in the near future. This committee will endeavor to secure as much publicity as is possible in connection with the awarding of these medals, through the local newspapers of the districts in which the winners reside.

The most important activity of the committee as a body has been the fostering in California of the Power Companies' Employees Home Lighting Contest which involves the study of the same Primer as was used in the school children's contest, and practically the same effort on the part of the power company employees who participated in the contest.

Six California companies have definitely signified their intention of participating in this contest, and ordered 7,000 Primers for distribution among their employees. In order to stimulate additional interest and enthusiasm, the Lighting Bureau of the Pacific Coast Electrical Association has offered a prize of $50 and has issued and distributed among the participating power companies, posters calling attention to the contest and to the various prizes which it is possible for an entrant to win.

The committee has also communicated with all power companies in California urging them to undertake a kitchen lighting campaign before the interest which the school children's contest aroused has subsided. Three power companies already have such sales effort under way, while two others have their plans about perfected.

Another activity which the committee has discussed but for which the final plans have not been worked out in detail, as yet, is that of overcoming the use of wrong voltage lamps, and the consequent loss to all parties concerned, consumer as well as electrical interests.

Another meeting of this committee will be held on April 3, at which time it is hoped that definite plans may be concluded for those activities which this committee has undertaken, but which are not yet under way.

It is too early at the time of writing this report to make a full report on the results of the Better Home Lighting Contest among power company employees. The contest will close on April 15, and this report is being submitted as of April 3.

A great many contestants have been enrolled and it is confidently expected, among the power companies participating, that a great deal of benefit will be derived by those employees who have joined in this work, and that the industry will benefit by the added knowledge.

A copy of the poster offering a prize of $50 for the winner of the Pacific Coast Electrical Association prize, and which was sent to all power companies, is attached to this report.

*V. W. Hartley, California Electrical Bureau, chairman; F. J. Airey, Pacific States Electric Company; Clark Baker, National Lamp Works; C. W. Cole, C. W. Cole & Company; J. R. Cravath, Pioneer Electric Company; G. H. P. Dellman, San Diego Consolidated Gas & Electric Company; M. C. Hixon, Edison Lamp Works; L. A. Hobbs, Edwin F. Booth Company; C. M. Masson, Southern California Edison Company; D. C. Pence, Illinois Electric Company; R. S. Prussia, Westinghouse Lamp Company; J. S. G. Ross, Pacific Gas and Electric Company; H. E. Sherman, Jr., Great Western Power Company.

Electricity and the California Dairy Farm

Report of the Subcommittee on Electric Power on the Dairy Farm.*

SO much publicity has been given the subject of electricity in agriculture that it is scarcely necessary at this time to go into the many problems yet to be solved in order to bring about more extensive use of electricity on the farm. It would seem more advisable to elaborate upon cases in some fields where the major problem "Electricity on the Farm" has actually been solved, and point out certain features in this field which could yet be developed with resulting increased business for the manufacturer, greater kw-hr. sales by the central station, and reduced costs of operation with greater production for the farmer himself.

No other state offers a better opportunity for such a study than does California, where the use of electricity

*Subcommittee on Electric Power on the Dairy Farm, Power Bureau, Commercial Section—J. E. Barrett, San Joaquin Light & Power Corporation, chairman; E. G. Stahl, San Joaquin Light & Power Corporation; P. S. George, Coast Valleys Gas & Electric Company.

for pump irrigation alone results in an annual use of from 300 to 600 kw-hr. per acre, and no type of farm is more attractive for a field of endeavor along such lines than the California dairy farm.

Essentially An Industry

A dairy farm may be looked upon as being essentially an industry, inasmuch as the raw product (products of the soil) are converted into products (milk, butterfat, etc.) ready for the market. The use of power on the dairy farm has the same characteristics as other industrial loads namely, relatively high load factors resulting from diversified use of power.

It seems that the work of promoting the use of more electricity on the dairy farm should first be backed by the central station, in that it results in a greater use of electricity with improving load factor conditions. Second, the manufacturer of dairy farm machinery should assist, inasmuch as this development offers him a large field of prospects for the sale of machinery. Third, the farmer himself should see the value of the movement, for in many cases it will be found that by using methods which require electricity he will be able to not only increase production, but also to reduce the cost of production.

California Dairy Farms

From the best information available, we find that there are approximately thirty thousand dairy farms in California, not taking into consideration any farms supporting less than twenty-six head. While electrification has progressed to a very large extent, it is safe to say that practically none of these farms are completely electrified; that is to say, there are none of these thirty thousand farms upon which more energy could not be advantageously used. This statement emphasizes the extent to which more equipment can be sold and more energy delivered before the saturation point will become a factor.

While no accurate figures are available as to what portion of the dairy farms in the state are users of electricity, or as to what extent it is used by those dairy farms which have the service available, a general knowledge of conditions gives a basis for certain assumptions which are used hereafter as a basis for showing the value of the dairy farm to those interested in the electrical industry.

The field may be divided into two groups; the first group being representative of all those dairy farms in the state which use electric energy for one purpose or another, and the second group representing those dairy farms which use no electric power whatever. The first group represents immediate prospects for the sale of additional equipment and kw-hr. The second group, although representing prospects, is of a different type, where economic laws must be given first consideration before any of the farms become potential prospects.

Tables I, II, and III show the value of dairy farms to the industry, considering value of equipment now used; value of equipment which it would be possible to add where service already exists; and value of equipment as applied to those farms now without service.

Table I—Dairy Farm Equipment
(Electrical equipment now in use)

	Number	Value	Kw-hr. Used Per Year
Pumps	16,000	$16,000,000	240,000,000
Cream separators	10,000	1,200,000	2,400,000
Milking machines	3,000	3,000,000	6,000,000
Sterilizers	500	100,000	1,600,000
Utility motors	500	100,000	700,000
Domestic service	13,000	3,250,000	2,600,000
		$23,650,000	253,300,000

The next step would seem to be the determining of a way in which the total electrification of the dairy farm may be accomplished and in order to discuss this, the various factors to be contended with must be given consideration. Let us, therefore, take up the different types of equipment under their respective heads.

Pumping Plants

The foregoing table shows 14,000 dairy farms in the state which do not pump with electricity. Of these farms there are probably many which either depend on natural rainfall or upon canal water for irrigation. Two thousand of the 14,000 already have service available for other uses and it is reasonable to assume that at least 1,000 of these will eventually go to electric pumping. Of the other 12,000, many also depend upon natural rainfall and canal water for irrigation and we may assume that half of these will eventually pump by electricity. However, some of them are located so far from existing lines that the economic factor would completely eliminate them as present prospects, but it is believed that if we reduce the original 12,000 by about 70 per cent, we will arrive at a figure which is fairly conservative. This then reduces itself to the statement that there are yet 1,000 pumping plants to be installed on dairy farms already using electric service, and 2,400 pumping plants on dairy farms where no service is available, making a total of 3,400 pumping plants in prospect.

Table II—Electrical equipment which could be added where farms have service available

	Number	Value	Kw-hr. Used Per Year
Pumps	2,000	$ 2,000,000	30,000,000
Cream separators	8,000	960,000	1,300,000
Milking machines	15,000	15,000,000	30,000,000
Sterilizers	17,500	3,500,000	52,000,000
Utility motors	17,500	3,500,000	26,000,000
Domestic service	5,000	750,000	1,000,000
		$25,710,000	140,300,000

Table III—Electrical equipment to be sold where no service is now used

	Number	Approximate Value	Possible Kw-hr. Used Per Year
Pumps	12,000	$12,000,000	180,000,000
Cream separators	12,000	1,440,000	2,900,000
Milking machines	12,000	12,000,000	24,000,000
Sterilizers	12,000	2,400,000	14,400,000
Utility motors	12,000	2,400,000	16,800,000
Domestic service	12,000	3,000,000	2,400,000
		$33,240,000	240,500,000

Cream Separators

The first factor which confronts us here is that many dairymen do not separate their cream, selling their product in the form of raw milk to dairy companies in cities, etc. This, in itself, will have a direct influence upon our assumptions. The previous table indicates that 8,000 dairy ranches do not separate cream by electric power, although they use power for other purposes; and that 12,000 dairy farms which have no electric power could use electric separators if power were available. On the surface, this would seem to indicate the possible installation of 20,000 cream separators, but due to the raw milk factor, of which we have no accurate information, we should reduce our figures at least 50 per cent. Then comes the economic factor dealing with distance from existing lines, which will still further reduce the figure for these farms which have no service available. In view of the fact that revenue is small for this equipment, and as a consequence no great amount of line can be built to serve it, this latter factor should be high. Let us assume that the 12,000, after being reduced 50 per cent on account of the raw milk factor, be still further reduced by a factor of about 80 per cent.

This leaves 4,000 electric separator installations where service is already available, and 1,200 where service is not now installed, or a total of 5,200 in prospect. Many of these machines are operated on the same meter as are residence lights, and for this reason, the cost of operation is a matter of guesswork, although the cost in many cases would not exceed $2.00 per month.

Milking Machines

Since milking must be done one way or another, it should be conceded that every dairy farm having service available can, by the application of the proper sales effort, be induced to install electrical milking machines. This development would result in the sale of 15,000 machines on farms now having service. If we are able to serve the 2,400 pumping plants on dairy farms not now having service available, the same sales effort would be able to get these same ranches to use electric milking machines. We, therefore, can assume the field will absorb 17,400 milking machines.

There are factors which might tend to reduce this number, but with proper sales effort these may be overcome. Many dairymen are of foreign extraction and have looked with suspicion upon mechanical milking. Some claim that cows go dry too soon when milked

by machine and others do not like them for the reason that they require cleaning and sterilizing after each milking; whereas, with hand milking this factor is not necessary. However, if a thorough study is made of the savings in labor which may be obtained by machine milking, these objections may be overcome. Many dairymen pay from $90 to $100 per month for good milkers, and are confronted with a labor problem when these men are asked to do other work. They take the attitude that they are paid for milking only and refuse to do anything else. In such cases the cost of labor runs from $1,200 to $2,400 per year, depending upon the number of cows milked. One definite case is known where one man and a milking machine are milking, twice daily, 65 cows. These cows yield about 64,000 gal. of milk per year; the machine consuming 2,250 kw-hr. per year at a cost of energy of $90. The machine itself cost $1,000 installed, and if we allow generous depreciation and interest on the investment, the cost of operating the machine would not exceed $300 per year, and it actually has replaced a man whose labor was costing $900 per year more than the operation of the machine. If this much could be saved for each of the 17,400 dairymen previously mentioned, the savings per year of labor cost would exceed 15½ millions of dollars.

Sterilizers

This type of electrical equipment is comparatively new to the dairyman. Practically every dairy farm has sterilization equipment, using oil, wood, or coal as fuel, but not until recently has there been much of an effort made to develop a unit operated by electricity. The most familiar type consists of a heat insulated tank, of convenient size, in which is installed a 5-kw. heating element. This apparatus gives sufficient steam pressure to allow thorough sterilization, at the same time supplying scalding water for washing cans, etc. One case is known where sterilization of cans, etc. for a herd of thirty cows costs but $3.60 per month; others show costs from $4 to $5 per month, depending upon the amount of milking done.

It should be possible with proper effort to have installed 17,500 of these on dairy farms now using service and one for each farm not now using service when it is possible to close with them for electric pumping. This would result in the ultimate installation of 19,900 sterilizers.

Utility Motors

Here is another use for power and equipment which has been passed up heretofore as very remote, due to the inconvenience in moving the equipment, which, in most cases, has been considered as including transformers, line, etc. Modern practice has proved that the farm yard can be so arranged that very little moving of equipment is necessary, this being accomplished by means of a portable motor with a flexible cable attached so that it can be conveniently moved from one location to another about a central point near the transformer pole.

The uses of the equipment are many, consisting of feed grinding, hay hoisting, wood cutting, operation of miscellaneous farm yard machinery, etc. The value of the equipment to the dairyman is more or less indeterminable, but it is known that much more chopped hay may be stored in a given space than would be possible with whole hay, which tends to economize in space. Then, too, the value of feeding chopped hay should also prove advantageous. It is claimed by the University of California Experimental Farm at Fresno that about 300 lb. of hay out of every ton is saved by chopping, this resulting by the cattle eating more or less of the stalks which are wasted to a large extent in feeding whole hay.

From the same source comes the information that 30 per cent more milk can be obtained per ton of hay in feeding chopped hay as compared to loose hay. If the output of an average dairy farm can be increased 30 per cent, the increase would be approximately 10,000 gal. per year, which, at 20 cents per gal., amounts to $2,500 additional return per dairy farm.

The idea of using this equipment must be sold by educational methods. In most cases the dairyman will have to be shown the value of feeding chopped hay before he can be considered a prospect.

It is estimated that only 500 dairy farms in the state are at the present time using utility motors, leaving a field of 17,500 in which to work up this business. It would be possible to utilize the pumping plant motor for this purpose, but not necessarily practical. It is felt that at least 15,000 motors for this use could be sold on diary farms now having service if it were possible to promote the idea of feeding chopped hay, ground feed, etc., and about 2,000 on farms where it would be possible to extend lines to serve pumping plants. Therefore, 17,000 of these motors could ultimately be absorbed by the dairy farms of the state.

Domestic Service

The previous table shows 5,000 farms having electric service available but not using it for domestic purposes and we should add to this number the homes on farms not now having service, but which are considered electric pump prospects. This would make 7,400 farm homes prospects for domestic service. Here, in many cases, intensive sales work will be necessary to induce the installation of appliances. Educational work is recommended, dealing with lighting of homes, also with regard to the many conveniences now on the market. The work of adding appliances in homes already using service is not to be considered at this time. We merely assume that each home added to the lines of the central station will be an average as to the number of outlets, number of appliances, etc.

Summary

Summarizing can be done to a better advantage by means of Table IV, which shows the value of the California dairy farm to the electrical industry, and which is a net result after taking into consideration the various factors to be contended with. This table shows the possibility of the sale of $30,654,000 worth of dairy farm equipment and household appliances, with the resultant sale of 176,010,000 kw-hr. per year.

Table IV—Total value of farms to electrical industry

	Number	Value	Kw-hr. Used Per Year
Pumps	3,400	$ 3,400,000	51,000,000
Cream separators	5,200	624,000	1,250,000
Milking machines	17,400	17,400,000	34,800,000
Sterilizers	19,900	3,980,000	63,680,000
Utility motors	17,000	3,400,000	23,800,000
Domestic service	7,400	1,850,000	1,480,000
		$30,654,000	176,010,000

This means that the California dairy farm is a prospect for over $30,000,000 worth of equipment. On referring to two particular types of equipment namely, milking machines and utility motors, it is noteworthy that the saving to be effected and increased return to be realized by the dairy farm represents a figure far in excess of the value of all equipment still to be installed.

The answer, then, would be first to attempt to put as much of this equipment into operation as possible, and then follow up each installation as a live prospect for additional equipment, to be paid for out of the resulting savings and increased return which is brought about. Comprehensive surveys should be made which would give the central station more definite information regarding this type of load, and close cooperation between central station and farmers' organizations must be maintained in order to accomplish the proper education along these lines.

Testing Service for Agricultural Pumping Plants

Report of the Subcommittee on Pump Testing Service, Agricultural Power Committee, Power Bureau, Commercial Section*

RURAL electrification in California has reached a point of greater development than in any other state in the Union. This comparatively advanced development is directly traceable to the fact that a vast amount of California irrigable land is served with pumped water. Electricity has proved to be the most economical power for operating pumps, and conse-

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quently the use of electrically powered pumps has become general throughout the agricultural section of the state. As a result, we have derived from our agricultural consumers sufficient revenue to warrant an investment for line construction which otherwise would not be justified. The result has been that the California farmer has available electric power for domestic, utility, and all other services. This has brought to him comforts and conveniences, ordinarily only available in larger centers of population.

Successful farming can no longer be conducted by haphazard methods. It has become a systematized business, with cost accounting records comparable with other business endeavors. While electric pumping costs are a small percentage of the total operating expenses of the farmer, the fact that these costs must be paid monthly, and the fact that most of his revenue is derived from annual crops, brings them constantly to the farmer's attention. Poor pump performance, and consequently low efficiency, of course, have a direct bearing on the power consumption, with a resultant increase in power bills.

Because the farmer has come to regard cost of operation as an item of importance, any increases in power bills immediately come to his attention, and he is most interested to determine the cause. For this reason it is thought advisable that the power companies lend such assistance as they can to help the farmer determine and correct the causes of poor pump performance.

The fact that this agricultural pumping load has not only made rural electrification possible, but also general, in California, would seem to indicate that it is, perhaps, the backbone of rural extension possibilities, and therefore warrants considerably more service and attention than many other classifications of business.

Those power companies who have already established a testing service for agricultural pumping plants have rendered a direct service to the farmer in having assisted him in establishing his operations on the most economical basis. The information that has been gathered in connection with the work has also made it possible to disseminate ideas on better irrigation methods, as well as directly increase the use of electric power for pumping.

This service, which is given without charge to the farmer, has also proved valuable in creating friendly relations, and has been a valuable asset to selling efforts in rural territories.

Equipment and Method of Testing

The over-all efficiency of the pump is calculated from the discharge, the power input and the measured lift. Where weirs, concrete reservoirs or tanks are installed at the plant, the discharge can be obtained easily enough. However, many plants discharge directly into pipe lines, and in such cases the General Electric flow meter is used. To connect the meter to the discharge pipe, a ¾-in. hole is drilled and tapped. A perforated brass tube is then inserted across the flow of water, the inside diameter of the pipe having been carefully measured. The meter itself consists of a glass U tube filled with mercury, the flow of the water exerting pressure on the tube of mercury causing it to rise or fall. The tube is calibrated so that readings can be made easily from the position of the mercury under the water pressure. Careful checks have shown this method to be very accurate.

The power input is ordinarily obtained by timing the revolutions of the disk of the meter.

Determining Lift

The lift is determined in several ways, depending upon the character of the installation. As pump manufacturers usually specify the size of suction and discharge pipes to the surface of the ground, it is not customary to make allowance for friction from the water level to this point.

When water is discharged at a higher level, a calibrated pressure gage is used at the surface and the measured lift from the water level to the gage is added to determine the total lift unless otherwise specified in the manufacturer's guarantee.

When deep well turbines are installed in well casings, a small electric sounder is lowered to the water level by means of a steel tape. As the surface of the water in this casing is often covered with several inches of oil from the lubricating system, the sounder must be operative after its point has passed through the oil. When the sounder is withdrawn, the tape is measured to determine the lift.

In some cases the pumping level is determined by air pressure. A measured length of ½-in. pipe is lowered at the time the turbine is installed. The pipe is lowered to allow several feet of water to stand in the lower end. The top is fitted with a pressure gage below which is placed a valve. Air is pumped through this valve until the gage reads a maximum value, which reading determines the water level. The gage is read before starting the pump and again after it has been operating for a short time. These readings give the draw-down due to pumping.

Given the flow, the power, and the lift, it is a relatively simple matter to determine the efficiency of a pumping plant.

In order to make more definite comparisons of the efficiency of the pumps alone, the over-all efficiency is divided by the efficiency of the motor and the estimated efficiency of transmission where pumps are not directly connected to motors.

The complete cost of the pump testing equipment should not exceed $850. This equipment can be mounted in a case and be transported on a light car.

The expense of conducting tests varies with the distance traveled, location and arrangement of pumping equipment. A minimum cost would be about $5 per test.

A selection of the proper type of man for operator is essential. He should have sufficient technical knowledge and mechanical ability to conduct the test accurately, as well as enough tact and diplomacy to take advantage of the contact thus made.

Selection of Pumping Plant Equipment

The three-phase induction motor is almost universally used for well pumping. In sizes up to 35 hp., 220-volt motors are practical. Above 35 hp., 440-volt motors are generally used. The full load efficiency of standard three-phase induction motors is fairly constant—ranging from 85 per cent at 5 hp., to 91 per cent at 100 hp.

Centrifugal pumps, on account of lower first cost, are advisable for low head pump service where the seasonal draw-down is not excessive, and where the water plane will not be lowered by future installations. The best results are secured when the suction lift is not more than 20 ft., and as under most conditions the maximum depth of the pit should not exceed 20 ft., we may say, as a general rule, that the centrifugal pump is adaptable to heads totaling 40 ft.

Turbine pumps are used for higher heads, and, in some localities, for low heads where there is an excessive seasonal fluctuation and a probability of a future lowering of the water plane to a point where centrifugal pumps would not be practicable.

There is very little difference in the efficiency of either type of pump when properly installed, and the choice should be determined by first cost and water conditions.

The size of pump should be determined by the "water make" of the well and the flow of water necessary for the irrigation desired. The pump capacity should not be so great as to cause an excessive draw-down, as this may result in uneconomical operation and a short-lived well.

Where the quantity of water desired is less than the well can develop, the size of pump should be governed by the irrigation needs. Generally it is cheaper to use the smallest plant that will adequately water the area in question. There is a balance limit, however. The plant should not be so small that it will increase irrigation labor costs more than the probable power saving. A general knowledge of all conditions affecting size and type of equipment for a given installation is usually available through tests that have been run on adjacent plants. If this information is not available, a test may be run on the developing pump at the new well from which the proper choice of equipment can be determined.

Often the pump equipment is purchased on a guaranteed performance basis. An accurate test after the installation is made assists the pump manufacturer in living up to specifications and assures the farmer of getting what he pays for.

Efficiency of Irrigation Pumping Plants

The efficiency of irrigation pumps when correctly installed, should range from 58 per cent to 70 per cent and the over-all efficiency of pump and motor should be at least 50 per cent and sometimes runs as high as 64 per cent.

The cause of poor performance seldom lies in the power service, but nevertheless the power company is oftentimes held responsible for high operating costs. In these instances a test on the pumping plant will at least definitely establish the cause of poor performance, and many times a correction can be made at a nominal expense with a great saving in the cost of water.

It might be of interest to cite an example of the importance of good pump efficiency, which was brought to light through the testing service. A certain rancher operating ten 50-hp. pumping plants, on the west side of the San Joaquin Valley, happened to have two of these plants located just one-half mile apart. Apparently, the water conditions of the two wells were exactly the same and the same type of pump and motor was installed at each well. The power input to the motors was approximately the same. One well delivered 1,200 gal. per min. and the other only 422.

Table I—Copy of report which is submitted to consumer, showing results from test on pump plant.

CRAWFORD-NOBLETT PLANT—CARUTHERS
Equipment

Meter—Westinghouse—5 amp.—220-volt—No. 31969 in series with potential and current transformers, ratio 20 to 5.

Motor—Fairbanks Morse—15 hp.—220 volts—1,140 r.p.m.—Serial No. 72586 direct connected to

Pump—Fresno Agricultural, 6-in.

Test Results

	First Test	Second Test
R.p.m. of motor and pump	1,080	1,148
Pumping level from center of pump	24 ft. 6½ in.	24 ft. 9 in.
Lift above center of pump	17 ft. 5½ in.	15 ft. 6 in.
Total head	42 ft.	40 ft. 3 in.
Gallons per minute pumped	420	904
Miners inches pumped	46.7	100.5
Acre-feet pumped in 24 hours	1.9	3.99
Kilowatt input to motor	9.02	12.54
Horsepower input to motor	12.1	16.81
Kw-hr. per miners in. in 24 hrs	4.6	2.99
Kw-hr. per acre-feet pumped	115.6	75.07
Aver. cost per kw-hr. over period of 1 yr.	$0.02	$0.02
Average cost per acre-foot	$3.812	$1.5014
Overall efficiency	36.9%	54.5%
Pump efficiency	43.0%	64.2%
Percent full load to motor	71.0%	98.3%

After the first test was made, a report was submitted with recommendations for changes necessary to improve efficiency of operation. The second test shows results secured after changes were made.

A test on these two plants determined the fact that the turbine bowls on the plant delivering the lesser quantity of water, were set considerably above the pumping level. The fact that it was necessary for this pump to work under what was practically suction limit, would not permit of more than a 40 per cent capacity load. Under these conditions, the cost per acre-foot of water delivered, from the 422 gal. per min. well, was $7.56, as compared with $2.37 per acre-foot from the 1,200-gal. per min. well. A knowledge of these facts persuaded the farmer in question to recondition and lower the pump which was delivering only 422 gal. per min. The cost of these repairs amounted to only a small proportion of the loss he had been sustaining for the past year.

A second test on the two wells, after the change had been made, showed that both wells were producing water at approximately $2.37 per acre-ft. In this instance, the possible saving was much greater than is found in the average case. However, the example illustrates the possibilities of the service. A typical report on a test is shown in Table I.

Causes of Poor Pump Performance

An analysis of the tests made over a period of three years indicates that there are three principal causes for improper operation: first, changes in conditions after the pump has been installed; second, pump wear; third, the proper pump to fit the conditions as they exist is not always the one selected.

It appears that the power company is the logical medium for carrying on this testing service. In the first place, there are several benefits to the power company itself to be obtained through this work. It is an excellent aid in eliminating complaints; it is of considerable help in sales endeavor; it gives a good contact with all classes of farmers, and helps sell the idea that the industry is interested in their well-being.

The benefits to the consumer are numerous. It offers a protection against unscrupulous agents. It is a means of accurately determining performance, and consequently permits the farmer to buy on a guaranteed basis. It serves as a guide to determine when repairs and reconditions should be made. It helps determine the cause of poor performance and what should be done to correct it. It makes possible a correct knowledge of water costs and application. From the application data, information on water duty for different type soils is made available.

From the results of the tests already conducted, the power company has an accurate record of water conditions in various parts of the territory it serves. From this data, it has been possible for salesmen to sufficiently inform themselves on water duty, so that they can quote cost figures on crop irrigation as well as make a reasonable estimate of pumping plant requirements. This information is of material assistance, both to the farmer and the power company.

With the definite information made available by these tests, it becomes much less difficult to spread the fact that electricity is the most economical power for pumping.

Generated vs. Purchased Power in Various Industries

Report of the Competitive Power Committee, Power Bureau, Commercial Section*

FIVE important phases of the question of using central station energy as against energy generated in isolated plants were considered by this committee during the year. This work was assigned to various subcommittees as follows:

Waste Heat Utilization in Cement Plants for Power Generation vs. Purchased Power	W. F. Neiman
Generated vs. Purchased Power in Laundries	J. C. Kyle
Generated vs. Purchased Power in Sawmills	H. N. Carroll
Generated vs. Purchased Power in Large Hotels	G. A. Peers
Large Diesel Engine Installations	W. F. Neiman

Reports were prepared covering the first, third and fourth subjects and a temporary report on the second subject, with the promise of a more complete report at a later date. No report has been made on the fifth subject. Limited copies of these complete reports will be made available for those members of the association desiring them. The following summaries of each re port give an idea of their scope.

Waste Heat Utilization in Cement Plants

Waste heat utilization for power generation in cement plants is a proven engineering possibility, but its economic practicability depends not only on the amount of heat that may be recovered from the kiln gases and the relative amount of power that may be produced from the steam generated by the passing of these gases through waste heat boilers as compared with the amount of power required in the production of cement from the material available, but also on the full cost of the power thus generated (and the cost of any additional power necessary) as compared with the cost of the total power required, if otherwise produced or purchased. Another factor entering into the economic side of this question is the supply of limestone. If this, or the market, is limited a cheap plant is desirable and therefore the extra and large investment in waste heat apparatus would not be warranted.

The cost of a waste heat plant if constructed in connection with a new cement mill is estimated at 25 cents per barrel of annual production (present day prices) and the cost of converting an old mill is estimated at double that amount, both by an independent engineer. The cost, however, depends largely on conditions and varies over a considerable range in the conversion of

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established cement mills. The only reliable information received concerning actual costs of waste heat plants was from a 7,000 bbl. per day plant located in Iowa. This was an old mill converted to waste heat power production in March, 1921, and the average cost per barrel of annual production (365 x 7,000) was a little over 52 cents.

The temperature of the gases leaving the kiln is approximately 1,500 deg. F. and after passing through the boiler about 350 deg. F. One plant reports the temperature of the kiln gases as 1,550 deg. F., the temperature on entering the boiler as 1,225 deg. F., on leaving the boiler 480 deg. F., and on leaving the economizer as 360 deg. F., and state that their average evaporation for a period of a year was 425 lb. of water per barrel of clinker produced—this boiler plant is designed to operate at 200 lb. pressure with 100 deg. F. superheat.

The amount of coal burned in the kilns per barrel of cement produced is approximately 100 lb., and the utilization of the waste heat therefrom in a properly constructed plant should yield on the average 350 lb. of steam at 200 lb. pressure and 100 deg. F. superheat. With a turbine using 17½ lb. of steam per kw-hr. delivered at the switchboard, 20 kw-hr. would then be available for each 100 lb. of coal burned. The amount of power consumed per barrel of cement produced varies from 13 to 24 kw-hr. according to data gathered from a number of plants from various parts of the country, and depends on the relative hardness of the cement making material and the fineness to which it and the finished product is ground. The amount of power used in California in cement plants appears to be around 15 to 17 kw-hr. per barrel produced.

From the above it can be seen why some plants can produce all their power requirements, and even an excess, from the kiln gases while others have to burn auxiliary fuel or purchase additional power to make up the deficiency. As all cement plants shut down annually for overhauling, those having waste heat power plants have to burn auxiliary fuel during such period or purchase such power as they may require during that time, and the burning of auxiliary fuel or the purchase of auxiliary power materially reduces the benefits derived from waste heat utilization, and may even absorb them completely. For this reason each waste heat plant is a problem in itself and can only be solved correctly and economically by careful consideration of all the factors entering into the production of cement as well as power, and in the latter the full cost including fixed charges must be reckoned with.

From data received in the course of the investigation on waste heat utilization for power production in cement plants, the cost of power exclusive of fixed charges varies from 3½ to 7½ mills per kw-hr. where sufficient steam is produced to generate all their power requirements while the cement mill is in operation. Where this is not the case the cost (exclusive of fixed charges) may even exceed one cent per kw-hr. The mark strived for in the best plants seems to be one-half cent per kw-hr., however, this is seldom attained. The fixed charges under favorable construction costs vary from 2½ to 3 mills per kw-hr. and the full cost in the best plants is approximately ¾ cent per kw-hr., the others ranging upward.

One plant in Iowa from which full and complete costs of operation, maintenance, repairs and investment were obtained operated at a cost including fixed charges of 7.57 mills per kw-hr. This was a 7,000-bbl. a day plant, maximum demand 6,000 kw., and operated at a load factor of 81.8 per cent. The cost of the same amount of power if purchased on the lines of the Pacific Gas and Electric Company would have been an average of 7.52 mills per kw-hr., or a saving of $176.63 per month, not considering the intangible cost incident to all private plant operation, nor the fact that this investment in the business itself would earn more than the 6 per cent figured as a charge against the plant.

From the investigation then it would appear that at least in California power can be purchased at a less cost than it can be produced by the utilization of the waste heat from the kiln gases in the manufacture of cement, and this probably accounts for the fact that there are no such plants in this state. In the East where power rates are higher, the opinion among cement maufacturers seems to be evenly divided as to whether or not waste heat power production is cheaper than purchased power, but from the data at hand it seems quite likely that some of these concerns would have saved money, in addition to having the capital outlay available for more productive purposes, had they purchased their power instead of investing in waste heat power producing apparatus.

To those interested in information more in detail, copies of the report covering the investigation of this subject will be available.

Generated vs. Purchased Power in Laundries

The subcommittee having this subject under investigation have been gathering data on 32 laundries, 22 of which operate with purchased power. Laundries as a rule express their power costs in percent of gross business done and usually include under this item fuel for the production of steam (and for power where it is generated) labor of engineer, lubricating oil waste, etc., cost of power where purchased, and sometime, though rarely, interest, depreciation and taxes on steam and power producing equipment. While this method gives a general line on the combined cost of steam and power, especially where the amount of gross business done is known, it is not definite enough for a real comparison of power costs unless a number of other pertinent factors affecting conditions are known, as well as what items of the above list are included in such costs.

To illustrate this point it may be mentioned that different types of washing machines require different quantities of water for the same load of goods. As this water is heated by steam, either live or exhaust, and as some washing machines require twice as much water per run as do others, it is evident that this condition alone will cause a wide variation in the item of fuel, so that a comparison between several laundries based on the combined steam and power costs may be quite misleading in so far as the actual power costs are concerned, unless the amount of water used per dollar of gross business is also known and is similar for each of the cases compared. Other illustrations might also be mentioned, but space will not permit.

The results of the investigation on these 32 laundries will, however, be of value when they are tabulated, and if sufficient information is secured concerning them they may furnish a fair basis of comparison between costs of purchased and generated power in general. Unfortunately, to date, information on only about a third of these has been received in sufficient detail to be of use, and a proper comparison of generated and purchased power costs is not afforded by them. It is hoped, however, that the balance of the data will be received in time to be available for those interested.

In addition to the gathering of this data on the 32 plants mentioned an actual test was made in a laundry producing most of its power by steam engine and line shaft drive, a small amount being purchased from a central-station power company to operate a few machines equipped for motor drive. A four weeks test was conducted by engine drive followed by a four weeks test driving the line shaft with a motor with central-station current. When the engine was in operation a tank of water was heated by exhaust steam, and this hot water was used in the washing machines and for feed water for the boiler. Live steam was also used in the washing machines to bring the water up to the proper temperature, and for heating the mangles, driers and other machines. When the motor displaced the engine no exhaust steam was available, and therefore no hot water, so live steam was used exclusively in heating the water in the washing machines, as well as for all other purposes.

The theoretical saving in fuel oil to account for the heat extracted by the engine in producing the power required for operations for four weeks was 6.99 bbl. If then, all of the exhaust steam produced was used, and its heat was available in the washing machine without loss, then this 6.99 bbl. of fuel oil would be all that could be saved in fuel if the plant was operated electrically. The test, however, showed a saving of 39.08 bbl. of fuel oil for the four weeks and proved that in the practical utilization of the exhaust steam over two-thirds of its heat value was wasted and not used. The amount theoretically chargeable to power production was 13.02 per cent of the fuel oil necessary to produce the steam used by the engine, and the re-

sults of the test proved that the actual amount chargeable was 72.8 per cent. The boiler efficiency during steam drive averaged 64.43 per cent and during the electric drive test 64.28 per cent, and the evaporation was 11.03 lb. of water per lb. of fuel oil during steam drive and 10.61 during electric drive. The amount of water used for washing per dollar of gross business was 13.157 cu. ft. during steam drive and 12.882 cu. ft. during electric drive, and the gross business done was $12,309.14 during the steam drive test and $12,588.58 during the electric drive test. The actual fuel oil saved was approximately 16.2 per cent of the total that would have been used for engine operation including steam for all other purposes. The power regularly purchased (2,100 kw-hr. for four weeks, which includes that used by a 10-hp. well water pump which furnished about 62 per cent of the water) represents about 29 per cent of the total power requirements, the balance (71 per cent) being produced by a St. Louis Corliss engine through line shaft drive. With individual motors the total power required for four weeks would be 5,855 kw-hr.

With fuel oil at $1.82 per bbl., the price paid, the extra power (3,755 kw-hr.) can be purchased for less than the saving made in fuel oil alone. The total annual steam and power costs as normally operated (engine drive and purchased power, including interest on investment, depreciation, maintenance, repairs, taxes and insurance on boilers, engine, line shaft equipment, motors and wiring; also engineer's salary and power bills) was $10,425.74 for a gross annual business of $163,651.54. This represents a cost of 6.37 per cent of the gross business, including fixed charges as well as all other items properly chargeable to steam and power costs. If all the power was purchased the total amount cost of steam and power would be $9,948.51, including interest, depreciation, etc., on the extra motors and wiring necessary for individual motor drive, a saving of $477.23 per year. This total steam and power cost represents 6.08 per cent of the gross business. If an engine generator set was installed and all electrical power generated the total annual minimum cost possible would be $10,749.83, or 6.57 per cent of the gross business. The saving made by purchased power is not the complete saving that would be made, as none of the intangible costs incident to power production were included in such costs, and on the other hand the bills for purchased power include everything. Then, too, the salary of the engineer ($40 per week) was figured at the same amount for all cases, whether steam alone was produced or whether steam and power (in part) was produced or whether steam and the total power used was generated. The load factor of this plant (individual motor drive) would be 20.45 per cent based on the maximum demand and 24 hours per day, 7 days per week, and based on the actual hours of operatioin (192-5/6) for the four weeks it would be 71.27 per cent. The maximum demand would figure 66.3 per cent of the rated horsepower of connected load of the individual motors required.

The washing machines in this laundry are the old type wooden ones. If the new type metal machines were installed the annual saving effected by purchased power would be at least $1,937 over generated power. The conclusions from this investigation are that at the present prices of power and fuel oil a considerable saving can be made with purchased power over any other method of operation, and that in new laundries, properly equipped, the possible saving is so large that nothing but purchased power can reasonably be considered.

Generated vs. Purchased Power in Saw Mills

The subcommittee investigating this phase of competitive power sent out questionnaires (patterned after those sent out to waste heat cement plants) to sixteen saw mills in California and one in Oregon and received five answers in reply, only one of which contained sufficient information to be of value, and even this one was not definite enough for the purpose of figuring power costs per kw-hr. In the first place the capital invested in power producing machinery was not given, hence the fixed charges could not be figured. Second, the operating and maintenance costs including repairs ($15,000 per month) covered a part of the mill not electrified (engine drive) and steam for the dry kiln, as well as the electric power producing part. Third, the kw-hr. generated were stated at 3,000 kw. per working day. This was probably intended to be an average load of 3,000 kw. per day during the time of operation, but the number of hours run per day was not given. The subcommittee figured this as approximately 1,053,000 kw-hr. per month, but they may have had further information on the subject.

The maximum demand was given as 4,000 kw., and the output of the mill at 9,000,000 ft. of lumber per month, but the kind of lumber worked was not noted. From the above the average use of power per 1,000 board ft. is 117 kw-hr., and from data at hand the average in saw mills is 27 kw-hr. for sugar pine lumber and 54 kw-hr. for redwood lumber. Where a saw mill and planing mill was combined the average with sugar pine lumber was found to be from 52 to 59 kw-hr. per 1,000 board ft., the planing mill handling a considerable portion of the output of the saw mill. Inquiry of the San Francisco office of this particular lumber company secured the information that the timber worked was principally redwood, but that some fir was also worked, and that a planing mill was operated in connection with the saw mill, in which case the 117 kw-hr. per 1,000 board ft. figured above is not unreasonable, for power consumed in redwood mills is about double that of sugar pine mills.

The findings of the committee in this instance were that this power (1,053,000 kw-hr. per month) could be purchased from the San Joaquin Light & Power Corporation under their wholesale rate for $11,577.50 or a saving of $3,422.50 per month over the operating charges noted above ($15,000) and if purchased from the California Oregon Power Company under their special lumber mill rate the saving would be about $5,000 per month. The operating charges, however, cover other operating expense besides that for electric power generation, the proper segregation not being known. The fixed charges covering electric power generation (amount not known) may or may not cover that deductible portion of the operating charges properly belonging to activities other than electric power generation. It would appear, however, that this mill if located on the lines of either of these power companies (though it is not) could purchase power at a saving if this saving was not wiped out completely by the cost of disposing of the additional lumber refuse resulting from operating the boilers only for the purpose of supplying the dry kilns with steam.

To properly get at this problem a personal investigation should be made of some representative mill, the operators of which were sufficiently interested in securing the real facts to be willing to cooperate with the investigator to the extent of lending every possible aid in securing the actual investment and operating costs from their books or records, and in making such other investigations and tests as would establish a proper basis for figuring the cost of power production and all other incidental things, that might effect the practical utilization of outside power service. Such an investigation would probably take three months continuous time of a man particularly qualified for such work. A similar investigation was made in connection with the laundry problem and resulted in the discovery of some practical facts which greatly discounted the value of exhaust steam, at least in its application in this industry. If such an investigation could be made of the saw mill problem, covering actual practical operation, something might be discovered that would upset some of the time-honored assumptions, but if not at least the actual facts would be known as well as the practical limitations of generated and purchased power in this industry, a worthwhile thing in itself.

The general findings of the committee on this subjest were as follows:

1. The information obtained was too meager to make a thorough analysis of the subject, due to the methods of accounting in use by the lumber companies which do not take into account all of the factors effecting the actual cost of generated power. Further, it is quote probable that if both the direct and indirect costs of all shutdowns incident to power generation were charged to this account the advantage would lean greatly toward central-station power on account of its greater relative dependability.

2. In most plants steam is necessary for the dry kilns and the generators are operated with surplus steam from free fuel which would otherwise have to be

disposed of in an incinerator, and under these conditions it is obviously more economical to operate an isolated generating plant than purchase central-station power.

3. In plants so located that there is a market for waste fuel or firewood for domestic consumption and where steam is not used for dry kilns, it is more economical to buy central-station power than to operate an isolated plant.

4. The ideal arrangement for the lumber companies is to maintain a generating plant the size of which should be governed by the reserve capacity of the boilers in relation to the average available fuel (waste fuel); this plant to be tied in with central-station lines under a reciprocal agreement governing input and output, to guarantee continuity of service.

5. It is more economical to buy central-station power for logging operations.

6. The power salesman's best line of approach and contact is upon the point of continuity of central-station service. Other arguments depend largely upon local conditions.

Copies of this report in full with answers received to questionnaires will be available to member companies.

Generated vs. Purchased Power in Large Hotels

More and more hotels are being converted to central-station current throughout the country due to the economies in engine room operation that can be secured by this method only. This tendency is more noticeable in the East than in California, probably due to the hot summers which make exhaust steam of no value whatever during that season. The value of exhaust steam in hotels, however, is much over-estimated, for as a particular matter of fact large quantities of it are usually wasted where plants are operated non-condensing due to the fact that the heating demand curve does not parallel the power and lighting demand curve. Where part of the machines are operated condensing in order to save this loss, the power thus generated costs considerably more than purchased power, though not as much more as it would with non-condensing machines where the exhaust is wasted. The greatest economy, however, is secured through the much lower operating and maintenance costs of electrically driven auxiliaries over the steam driven ones, and the saving effected by the absence of a lot of machinery and a maze of steam pipes which require costly attention and occupy valuable space. Then, too, operating the boilers at low pressure for steam heating also effects a saving over high pressure boilers using reducing valves for this purpose, so if exhaust steam is no longer used the pressure on the boilers should be reduced to 5 or 6 lb. gage. If a small quantity of high pressure steam is necessary an auxiliary boiler should be operated for this purpose.

A temporary report was made on the operations of a very large hotel in San Francisco about two years ago (when fuel oil was $1.20 per bbl.) in which the approximate saving to be made with purchased power and low pressure steam for heating (all auxiliaries to be operated electrically) was figured to be at least $5,600 per year. Had it been possible to make an actual test the saving would have been greater as it was assumed that all the exhaust was used for heating. The report was made in the month of January when this probably was the case but in later months following large quantities of exhaust steam were observed to be escaping into the air. An eastern engineering concern estimated the cost of changing over the plant at $50,000, and stated that they were willing to guarantee an annual saving of $35,000 if allowed to direct the operation of the plant, for which they asked a fee of $3,600 per year in addition to the cost of the change.

The findings of this subcommittee are that no new hotels are putting in electric power generating plants. That the cost of power in hotels with plants under 300-kw. capacity is not less than 3 cents per kw-hr. and that central-station current for hotels having a demand of over 150 kw. can be purchased for less. That for larger installations the cost of generation is considerably less, and that in one installation of 900-kw. capacity the cost with fuel oil at $1.65 per bbl. was 1.45c per kw-hr. or over, but that central-station current was available at quite a bit less than this figure. That the main reason for not purchasing power lies in the apparent economy in the use of exhaust steam for heating and laundry work, but that this advantage is more apparent than real. Finally, that in hotels having power producing machinery in operation they are likely to continue generating during the useful life of that apparatus, as it has hardly more than junk value for any other purpose.

It is this latter fact that makes it hard to convert existing plants, especially as additional outlays are usually necessary to effect economies of operation with the adoption of purchased power, yet as existing plants get older they become less economical and repairs become more costly and an investigation of actual conditions will often reveal the fact that it would pay to junk the plant long before it actually wears out.

Copies of this subcommittee's report will also be available for distribution.

Large Diesel Engine Installations

The subcommittee having this subject in charge was so busy on other subjects that no time was available for an investigation of this one and no report was made.

The Diesel engine, on account of its large first cost, and consequently its much greater fixed charges, will show its most economical costs per unit of output at high load factor. Such high load factor is offered by the ice making industry, the machines for the manufacture of which are operated 24 hr. per day for usually eleven months per year. If, then, the Diesel engine is at all a serious competitor of central-station power it would demonstrate that fact most effectively in its application to power production in this industry.

The results of the investigations of an independent engineer for the benefit of those interested in ice making are given herewith and they apply to a 100-ton, high-pressure, raw-water ice plant producing 32,000 tons per year and operating with 1,600 300-lb. cans and 35,000 ft. of 1¼-in. pipe, 4-can lift, automatic fill, and 10,000-ton season ice storage. The results include energy at 1½ cents per kw-hr., coal at $4.50 per ton delivered, and fuel oil for the oil engines at 5 cents per gal. delivered.

Type of Plant	Total Yearly Mfg. Cost	Yearly Power & Fuel Cost	Per Cent Power or Fuel to Total Mfg. Cost
Motor-driven	$69,630	$22,100	32.0
Uniflow steam Engine-driven	74,932	9,300	12.5
Full Diesel oil Engine-driven	74,362	8,800	11.9
Semi-Diesel oil Engine-driven	76,294	11,160	14.7

From the above it will be noticed that with motor drive and central-station current the yearly manufacturing cost is the least, but the percent the power bills bear to the total expense is more than double the ratio of fuel expense to total expense of the steam and Diesel engines. The fuel expense of course is not the total expense of power for either the steam, Diesel or semi-Deisel engines, but machinery salesmen, especially of the oil engine variety, try to make it appear that way in their unfair comparison of fuel costs with central-station power costs, and it is this that impresses the uninformed rather than any actual competitive value they might possibly possess.

The cost per ton of ice manufactured, which includes operating costs and fixed charges, water, ammonia, storage, etc., is as follows:

Motor-driven plant	$2.17 per ton
Uniflow steam engine-driven plant	2.34 per ton
Full Diesel oil engine-driven plant	2.32 per ton
Semi-Diesel oil engine-driven plant	2.38 per ton

In the cost for motor drive purchased power was figured at 1½ cents per kw-hr. If this plant was on the line of the Pacific Gas and Electric Company it would earn an average rate of 9.4 mills per kw-hr., and the annual cost of power instead of being $22,100 would have been $13,839.60. The cost per ton of ice would therefore have been $1.92 with purchased power, the other items entering into manufacturing costs remaining the same—such as labor, investment, water, ammonia, etc.

The opinion of this subcommittee is that the Diesel engine is not a real competitor of central-station service where rates as low as those in effect here are available and the service is dependable.

The Industrial Application of Electric Heat

Report of Subcommittee on Industrial Heating, Power Bureau, Commercial Section*

THE following is a composite report of the work of the members of this subcommittee, but cannot adequately cover the papers prepared by the committee members on the individual subjects assigned to them. The following papers have been mimeographed and are available for those who desire them:

Baking Cores by Electric Heat	E. J. Cipperly
Using Electricity for Heat Treating	E. J. Cipperly
Commercial Electric Cooking	T. A. Reid
Electric Melting and Refining of Iron	E. A. Wilcox
Electric Brass and Bronze Melting Furnaces	E. A. Wilcox
Electric Welding	F. O. Sievers
Electric Japanning Ovens	W. G. Tanner
Arc Heating of Steel	E. V. Kane
Electric Dehydration	W. W. Hicks
Vitreous Enamelling	H. A. Mulvaney

Without doubt the most spectacular application of industrial heating is the arc furnace. In the steel industry the arc furnace is taking a more and more prominent place—there being in excess of 100 electric furnaces in steel casting foundries in the United States. For the production of special steels and alloys the electric furnace is without a peer, there being in excess of 75 electric furnaces in this class of work. The United States census credits California with the production of 97,000 tons of steel in 1923, while slightly less than 7 per cent, or 7,000 tons, were produced in electric furnaces. In the United States that year 500,000 tons of steel were produced electrically, this being but one and one-half per cent of the total steel production.

If the census figures are correct, the existing electric furnace installations are a possible outlet for 175 million additional kw-hr. annually in California.

The amount of steel produced electrically, while a small part of the total, is increasing at a faster rate than the total production. Because of the ease and certainty of control of the factors which determine good steel and perfect castings, electric steel furnaces will continue to be the major application of electricity to industrial heating.

In melting and refining of iron, the electric arc furnace has already established itself in those fields where high quality of iron castings is demanded, and in this field, high quality has been attained at costs which compare favorably with the costs in cupola practice. The electric furnace makes available scrap which cannot be used in the cupola; prevents contamination from the fuel; makes possible close analysis of each heat, insuring a uniform product, and the temperature may be adjusted to any desired point to meet the exacting requirements of intricate castings without resorting to the excessive use of phosphorous with its deleterious effects. It is particularly interesting to note that with electricity costing seven or eight times more than coke, the electric furnace can frequently deliver a better quality product to the ladle at a lower cost than the cupola—this because of the saving in cost of the metal charged, and the lower melting loss and labor costs.

The electric furnace is particularly well adapted to the production of malleable castings. The charging, tapping and testing, with the electric furnace, are easily done; heats may be held for hours without injury to the furnace or metal, temperature and anlysis may be accurately controlled with less expensive charges, and a better grade of malleable casting is more readily produced. It is quite possible that because of the better grade of iron castings, and the consequent wider use, the arc furnace in melting and refining of iron will enjoy a more general application than exists in the steel industry.

The progress of the electric furnace in melting brass and bronze has been more rapid than in the iron and steel industry. Three types of furnaces are in use, with the field rapidly narrowing down to two. The indirect arc type is used for those applications where the furnace is used intermittently, or where the analysis must be varied frequently. There are 135 furnaces of this type in use in the United States. For those applications where there is continuous production and infrequent change in analysis, the induction furnace has been extensively installed, there being 275 of this type in the United States. The other type referred to obtains its heat from a granular resistor material, and the heat is reflected to the metal from the walls and roof of the furnace.

There are many reasons why the electric furnace has become so well established in this industry, among the more important being: low melting losses, large capacities, uniformly well stirred product, close control of anlysis and heat, saving in space, better working conditions and lower labor costs.

Another use of electric heat in the foundry is in baking cores. Last year when some installations of electric core baking were changed to gas on account of the power shortage in some sections, production and quality of core were lowered, and the chance to return to electric baking was welcomed. The automatic control and even distribution of heat possible in the electric oven, makes it particularly well suited to this class of work. This should prove a profitable field for active work on the part of power and oven salesmen, and this to the distinct advantage of the foundryman.

The fallacy of comparing the value of various fuels on a B.t.u. basis is particularly well illustrated in the heat treating processes where electricity, because of the high efficiency in application, the reduction of discards, the elimination of straightening and cleaning operations, and the improvement of the product, make it the most economical source of heat in the majority of cases. This does not take into consideration the practical elimination of shut-downs for repairs, and the comfortable working conditions for employees. The load, which is usually on the line from 10 to 24 hr. each day, is practically non-inductive; is a very attractive one for central stations and is one which can be safely sold with assurance that the installation will stay sold.

The field of electric welding has broadened rapidly during the past few years. The portable motor or engine-driven welding sets have made possible the use of arc welding at inaccessible places, and the development of automatic welding machines has improved the quality of work and made possible the welding of thin materials formerly thought impossible. The paper on this subject contains some valuable tables on current consumption and welding speeds for different kinds of work.

The use of electricity in japanning ovens is a matter which should receive careful consideration in each installation involved. Oil fired equipment has replaced electricity in some of the larger installations, but there seems to be a legitimate field for electric japanning ovens and these make very desirable loads. One company sold six japanning ovens in 1924, totaling 339 kw. and five varnish drying ovens with an aggregate capacity of 325 kw.

In the field of commercial cooking, the importance of the efficiency of the application has made possible a rapid expansion in the use of electricity. Restaurants, hotels and hospitals are using ranges, griddles, broilers, etc., in increasing numbers, and the canning industry is using electricity in some cooking processes to a marked advantage and at an overall cost which is actually lower than for fuel fired equipment. For baking bread and pastries, there is a wide range of dependable equipment available. The higher cost of electric heat is more than returned in decreased shrinkage, a barrel of flour actually producing more loaves of bread of a given weight than can be secured from fuel fired ovens. Add to this the increased production from a given size of equipment, better quality of product because of accurate control, cleanliness, improved working conditions, safety, saving in floor space and long life of equipment, and we have a very desirable piece of equipment for the consumer. This class of business has enjoyed a healthy growth during the past year.

The increased use of electric heat for vitreous enamelling has been hampered during the past year on the Pacific Coast by an unwarranted amount of publicity which has been given to some oil-fired oven experiments at a plant where a large part of the work had been done in electric furnaces. While some earlier types of electric furnaces have been displaced, the oil-fired equipment has not been in operation long enough to give

*John L. Farley, Pacific Gas and Electric Company, chairman; E. J. Cipperly, General Electric Company; T. A. Reid, Westinghouse Electric & Manufacturing Company; H. A. Mulvaney, Electric Sales Service Company; E. A. Wilcox, E. A. Wilcox Company; F. O. Sievers, General Electric Company; W. G. Tanner, Southern California Edison Company; E. V. Kane, L. A. Bureau of Power and Light; W. W. Hicks; W. L. Boxall, Southern California Edison Company.

conclusive results, and the furnace linings have already given trouble. It is believed that this experiment will reflect favorably on the application of electricity to this class of work. The two large duplex electric tub furnaces in the plant referred to are not being replaced, nor is such a move being planned at this time.

In the dehydration of fruits, some experiments have been conducted which are very favorable to the use of electric heat, especially for nuts where close regulation produces a superior product. This summer an experiment is to be conducted which should give some very valuable data. Two dehydrators, side by side and of the same size, and with the same attendants, one fuel fired and the other with electric heat, will be operated during the season. The dehydrating load is a very desirable addition to the agricultural load, both for the consumers and for the power companies, as it comes on at the close of the pumping season.

Another agricultural load which should claim the attention of central-station men is the hatching and brooding of chickens. Last year 22,000,000 chickens were hatched commercially in California. If this had all been done electrically, from 11,000,000 to 40,000,000 kw-hr. would have been consumed. One of the most attractive features of this equipment is that the power cost in the more efficient equipment is actually less than the fuel cost in oil equipment. Add to this the elimination of the fire hazard, and reduced attendance costs, and we have an appliance which is unusually attractive to the consumer. This device must receive practically uninterrupted service, and the fear of a shut down is one of the chief obstacles in the sale of this equipment. Incubators are not as exacting in their requirements as brooders. When the chickens are young and the weather cold, a fifteen to thirty-minute interruption in service would be disastrous. This load comes on late in December and continues through May.

With the improved equipment which is rapidly becoming standardized, and with the favorable rates available on the Pacific Coast, the application of electric heat to the industries is destined to be the major load supplied by central stations.

Electric Transportation and the Central Station

Report of Transportation Bureau*

THE Transportation Bureau has devoted much of its effort to the preparation of three series of letters calling the attention of executives, new business men and transportation and construction men to the advantages to be gained by using and sponsoring the use of electric trucks.

The bureau has also succeeded in arranging for an Electric Vehicle School to be held in San Francisco the week prior to the June convention of the National Electric Light Association. Through the activities of the bureau better team work among the truck and battery representatives, truck users and central stations has been brought about, tending toward a more unified and intensive sales effort.

The Electric Street Truck Committee has made a study of truck operation in comparison with gasoline truck operation and has developed some very interesting facts.

The Industrial Truck and Tractor Committee in reporting on the use of this equipment calls attention to present applications and to the large potential field for further use.

Recommendations

The Transportation Bureau as a result of its activities makes the following recommendations:

1—That the electric utilities very seriously consider the advantages to be gained by the use of electric trucks, which will result not only in a reduction of their own transportation costs, but also in the encouraging of other concerns to use electrics.

2—That a new committee under the jurisdiction of the Transportation Bureau be established to study transportation problems and operating costs of all equipment both gasoline and electric used by the electric utilities with a view of mutual aid in improving operating efficiency.

3—That a survey be made of Pacific Coast conditions to determine the percent of the total trucks in use that do work which could be handled by electrics.

4—That a detailed study be made of industrial truck and tractor applications and that articles dealing with special and unique applications be prepared for trade publications.

5—That an Electric Transportation Association modeled along the same lines as the one now existing in San Francisco be formed in Los Angeles to bring together for the promotion of common interest the truck and battery distributors, central station representatives and electric truck operators.

Educational Letters

The Transportation Bureau as a whole has devoted considerable effort toward the preparation of three series of letters designed to further interest the electric utility executives, new business men and transportation and construction men in the electric truck. These letters have been segregated into three series, the first of which consists of 13 letters to company executives, outlining the results that the electric utilities will realize by using and actively promoting the use by their consumers of electric trucks. The second series consisting of 12 letters are being sent to new business men and cover the reasons that the battery charging load is so ideally situated to improve the daily load curve and to yield such a high net revenue to the power companies. These letters suggest the value of designating an individual or bureau to specialize in encouraging the use of electric street and industrial trucks. The third series of 10 letters go to transportation and construction men who are primarily interested in economy and reliability of the trucks operated by the power companies themselves. For this reason great stress is laid upon the economy of operation, the ease of handling and the continuous service which the electric truck will show.

Figs. 1 and 2 show reproductions of several of the various letters which have been sent out. The appendix to this report contains the complete series sent to central station executives.

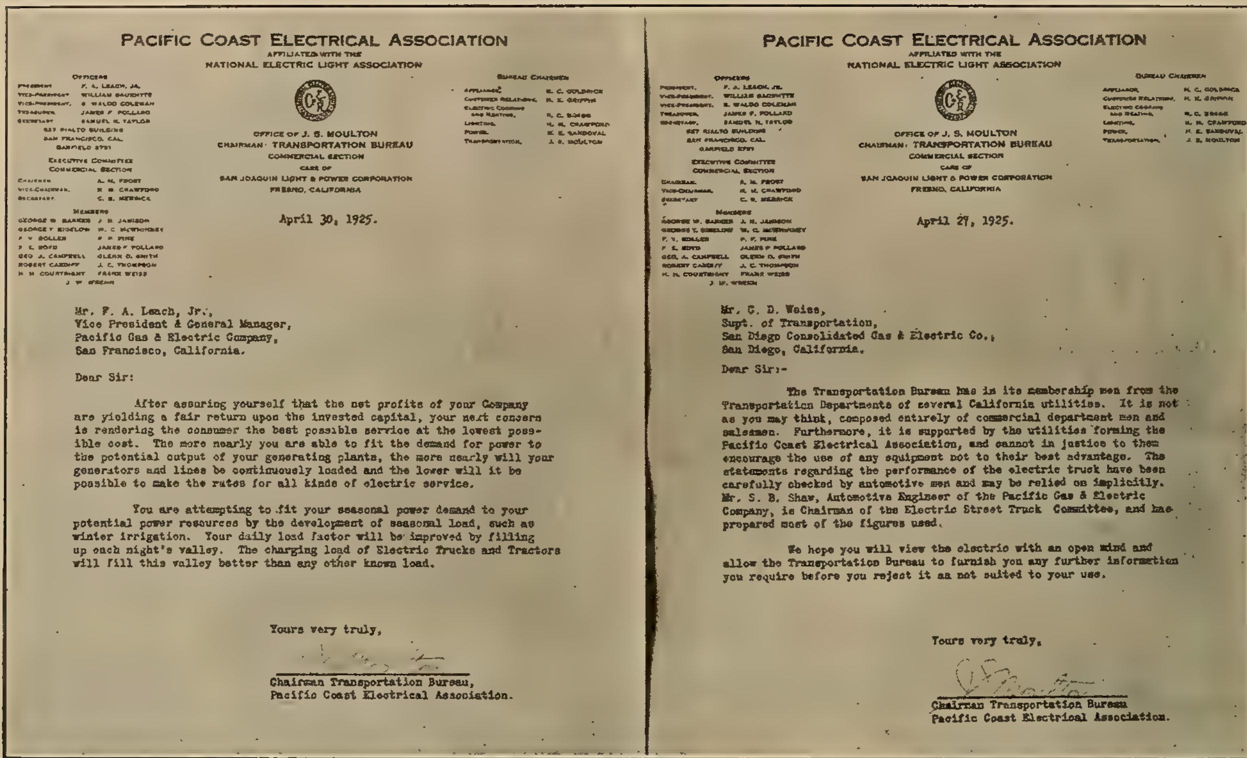
Electric Vehicle School

The bureau has arranged with the Transportation Bureau of the National Electric Light Association and its Electric Vehicle School Committee to have a school held in San Francisco the week prior to the National Electric Light Association convention. This school is to be similar to the one held in San Francisco two years ago and to those which have been held from time to time in New York, Boston, Chicago and other Eastern cities. This school, which lasts for one week, covers all aspects of the electric truck, including its construction, operation, battery construction and charging, transportation engineering and the selling of the trucks. The former schools have been attended by central station representatives and by operators of electric trucks. An attendance at the coming school of at least 40 is anticipated, and it is hoped that last minute enrollments will bring the number considerably above this.

*Transportation Bureau, Commercial Section.—J. S. Moulton, chairman, San Joaquin Light & Power Corporation; S. B. Shaw, vice-chairman, Pacific Gas and Electric Company; W. W. Willits, secretary, Los Angeles Gas & Electric Company.
Electric Truck Committee.—S. B. Shaw, chairman, Pacific Gas and Electric Company; Peter Ducker, Southern California Edison Company; J. L. Farley, Pacific Gas and Electric Company; Harry Easterbrook, Westinghouse Electric & Manufacturing Company; Ed. Hunt, General Electric Company; W. J. Shaeffer, Los Angeles Gas & Electric Company; H. N. Sessions, Southern California Edison Company; A. J. Theis, Pacific Gas and Electric Company; C. D. Weiss, San Diego Consolidated Gas & Electric Company; E. C. Wood, Pacific Gas and Electric Company.
Industrial Truck Committee.—Ira G. Perin, chairman, Elwell Parker Company; D. L. Hicky, Pacific Gas and Electric Company; H. C. Rice, Southern California Edison Company; W. W. Willits, Los Angeles Gas & Electric Company; H. B. Cleveland, Gunn Carle Company; Henry Boone, Industrial Supply Company; G. F. Wakeman, Edison Storage Battery Company; E. Kower, Electric Storage Battery Company.

Unification of Sales Effort

The bureau has through its committees brought together the various individuals and firms interested in the promotion of electric trucks and tractors with the result that as the various individuals have become better acquainted their cooperation toward increasing the use of electrics has been improved. The Transportation Bureau has done very valuable work in this connection and firmly believes that it has been a considerable assistance to the various interests in covering the broader aspects of electric vehicle promotion.



PACIFIC COAST ELECTRICAL ASSOCIATION
AFFILIATED WITH THE
NATIONAL ELECTRIC LIGHT ASSOCIATION

OFFICE OF J. S. MOULTON
CHAIRMAN · TRANSPORTATION BUREAU
COMMERCIAL SECTION
CARE OF
SAN JOAQUIN LIGHT & POWER CORPORATION
FRESNO, CALIFORNIA

April 30, 1925.

Mr. F. A. Leach, Jr.,
Vice President & General Manager,
Pacific Gas & Electric Company,
San Francisco, California.

Dear Sir:

After assuring yourself that the net profits of your Company are yielding a fair return upon the invested capital, your next concern is rendering the consumer the best possible service at the lowest possible cost. The more nearly you are able to fit the demand for power to the potential output of your generating plants, the more nearly will your generators and lines be continuously loaded and the lower will it be possible to make the rates for all kinds of electric service.

You are attempting to fit your seasonal power demand to your potential power resources by the development of seasonal load, such as winter irrigation. Your daily load factor will be improved by filling up each night's valley. The charging load of Electric Trucks and Tractors will fill this valley better than any other known load.

Yours very truly,

Chairman Transportation Bureau,
Pacific Coast Electrical Association.

PACIFIC COAST ELECTRICAL ASSOCIATION
AFFILIATED WITH THE
NATIONAL ELECTRIC LIGHT ASSOCIATION

OFFICE OF J. S. MOULTON
CHAIRMAN: TRANSPORTATION BUREAU
COMMERCIAL SECTION
CARE OF
SAN JOAQUIN LIGHT & POWER CORPORATION
FRESNO, CALIFORNIA

April 27, 1925.

Mr. C. D. Weiss,
Supt. of Transportation,
San Diego Consolidated Gas & Electric Co.,
San Diego, California.

Dear Sir:-

The Transportation Bureau has in its membership men from the Transportation Departments of several California utilities. It is not as you may think, composed entirely of commercial department men and salesmen. Furthermore, it is supported by the utilities forming the Pacific Coast Electrical Association, and cannot in justice to them encourage the use of any equipment not to their best advantage. The statements regarding the performance of the electric truck have been carefully checked by automotive men and may be relied on implicitly. Mr. S. B. Shaw, Automotive Engineer of the Pacific Gas & Electric Company, is Chairman of the Electric Street Truck Committee, and has prepared most of the figures used.

We hope you will view the electric with an open mind and allow the Transportation Bureau to furnish you any further information you require before you reject it as not suited to your use.

Yours very truly,

Chairman Transportation Bureau
Pacific Coast Electrical Association.

Fig. 1—Samples of some of the letters sent out by the Transportation Bureau

Revenue from Charging Load

Many users of electric trucks are also large users of power for other purposes and receive their total supply through one meter. For this reason, the revenue from battery charging for the various companies cannot be obtained exactly. The approximate revenue received and the number of trucks charged by each of the California utilities is shown in Table I. The 556 street trucks yield a revenue of $85,120, while industrial trucks probably add $40,000 to this, making a total of $125,120. The growing importance of the charging load is readily apparent from these figures. When it is further noted that practically all of this power is off peak, the high net revenue received demands serious thoughts as to how this load may be increased.

Table I—Revenue from Battery Charging of Electric Street Trucks

Company	No. Trucks Charged	Annual Revenue	
Bureau Power and Light	74	$13,300	(Approx.)
Great Western Power Company	58	8,350	"
L. A. Gas and Electric Company	251	39,800	"
Pacific Gas and Electric Company	104	15,000	"
S. D. Cons. Gas & Electric Company	2	360	"
San Joaquin Light & Power Corp.	20	1,840	(Exact)
Southern California Edison Company	38	5,470	(Approx.)
Southern Pacific Company	2		
Western States Gas & Elec. Company	7	1,000	
Total	556	$85,120	

ELECTRIC STREET TRUCKS

The application of the electric street truck to the transportation problem of the Pacific Coast cities has seemed to lag somewhat behind that of the larger Eastern cities of the United States.

There are several reasons for this, among which the following are probably the most important:

1—Traffic Density. The density of street traffic has not been so heavy in Western cities as in the larger Eastern cities, and for this reason the gasoline driven vehicle has not been handicapped to the extent that it has been where traffic is more dense.

2—Density of Population. The density of population is also greater in the Eastern cities than in those of the Pacific Coast. The greater the density of population, the more frequent will be the stops on delivery routes, and the shorter the hauls for general transportation purposes.

3—Street Conditions. The Western cities having grown quite rapidly in the past few years, have perhaps not been so extensively paved with hard, smooth pavements as those of the East. This element has probably worked a deterrent influence upon the use of electric trucks on the Pacific Coast to a certain extent.

4—Hills. Most of the larger Western cities are quite hilly. Some of the earlier models of electric trucks sold for use here were not properly engineered for hill work, and proved to be very slow on grades, resulting in a feeling among many users that the electric truck would not operate satisfactorily where hills were involved.

5—Lack of Promotion. The electric truck has not in the past been promoted on the coast by the power companies and the truck manufacturers to the extent that it has been in the East. On the other hand, gas truck sales have been pressed by a large number of very active manufacturers and dealers and the field has been well developed. This field has been increased greatly by the development of the California highway system, a large number of trucks having been sold for use in country and inter-city work.

Trucks In Operation

In spite of the deterrent influences mentioned, the electric truck has made considerable progress on the Pacific Coast. In California as of Mar. 1, 1925, there were in operation in this state 66 electric truck fleets, varying in size from 1 to 89 trucks each. The size of the trucks used varied from ½ ton to 9½ tons capacity. In Table II there is shown the distribution of electric trucks in California, according to capacities and the various industries by which they are used.

It will be noted that the largest users are those industries where the delivery problem is one of the most important elements of the business. That is, where regular house to house or store to store routes with frequent stops are involved. It is in this field that the electric truck can most easily demonstrate its super-

Table II—Distribution of Electric Trucks in California by Sizes and Industries Mar. 1, 1925

	½ & ¾ Ton	1 Ton	2-2½ Ton	3-3½ Ton	5 Ton & over	Totl
Ice cream		1	12	13	2	28
Creameries and dairies	20	131	48	1		200
Laundries	29	6				35
Ice companies	2	9	17			28
Baking companies	2	83	41	2	1	129
Express companies		2	12	2	4	20
Department stores	18	11	5			34
Mercantile stores		5	7	1	1	14
Public utilities	4	7	27	2	2	42
Soft drink manufacturers		1	4	3	1	9
Grain and milling				4		4
Municipalities	1		2	1		4
Miscellaneous			5		4	9
Total in use Mar. 1, 1925	76	256	180	29	15	556

iority over all forms of transportation for the reason that under such conditions, the electric truck can maintain a higher average speed, and do so without any material increase in its operating costs as compared with the rapid increase in operating costs of gasoline driven vehicles when an effort is made to obtain speed where a larger number of starts and stops are necessary.

Table III lists by capacities and the name of the user all electric trucks in California. It is to be noted that of the 556 trucks in use, the 1-ton and 2-ton sizes predominate, 436 or 78.5 per cent being of these sizes.

Advantages of Electrics

As indicated above, increasing traffic density has a tendency to force the use of electric trucks as it has done in the large Eastern cities. Increased traffic density results in a general slowing down of all traffic, particudarly as with this increased density there are necessarily a greater number of traffic stops to be made. The difficulty of finding parking space for delivery purposes is also increased. Under these conditions, the electric truck gains an advantage over the gasoline driven vehicle. There being no gears to shift, more rapid acceleration can be obtained, and the truck is more flexible to operate under conditions of constantly changing speeds. Furthermore, for trucks of equal capacity, the electric vehicle can be parked in a shorter space along side curbs for making deliveries, and there is, therefore, less time lost in locating available parking space.

The effect of traffic and frequent stops in reducing the average speed of motor vehicles is shown by certain investigations recently conducted in San Francisco. While the routes involved in these investigations included but a small portion of traveling in the more congested districts, and the number of stops other than for traffic interference averaged about one for every mile, it was found that the electric truck having a maximum speed of 14 miles per hour was able to attain approximately the same average speed as gasoline driven vehicles having maximum governed speed of 20 miles per hour. As the number of stops per mile is reduced, the gas truck might gain a slight advantage in speed over the electric truck, provided that traffic conditions permitted the use of the higher speed. On the other hand, as the number of stops per mile is increased, the electric truck soon gains a decided advantage in average speed. This increase in the average speed makes it possible for the electric truck to cover a given route in a shorter period, or a longer route within a given time.

The results of the comparative speed tests referred to, are shown in Table IV. In making these tests, the electric and gasoline trucks used were all of the same capacity—2 tons, and carried approximately full load at all times. Both trucks covered the same ground each day, making the same stops in the same order, although they did not always travel between stopping points by exactly the same routes. For instance, on one occasion, the gasoline truck traveled a considerable distance round a hill, whereas the electric truck went up one side of the hill and down the other. A "Servis Recorder" proved to be a very convenient device for obtaining this data. The routes were mainly through the residential districts and grades as high as 15 per cent were encountered.

It will be noted from the table, that the average speed of the gas trucks for the 10 days involved was 11.1 mi. per hr., and that of the electric trucks 12.1 mi. per hr. On account of the somewhat greater distance traveled by the gas trucks, and the slightly

Table III—Electric Trucks In California

	½-¾ Ton	1 Ton	2 Ton	3 Ton	5 Ton	Totl.
Fresno						
Benham Ice Cream Co.			3	3		6
Jersey Farm Dairy		5				5
Peoples Ice Corp.			2			2
San Joaquin L. & P. Corp.	3	2	2			7
Subtotal	3	7	7	3		20
Long Beach						
Long Beach Dairy Co.		3	7			10
Mountain View Dairies	1	6	1			8
Subtotal	1	9	8			18
Los Angeles						
Alfreds Ice Cream Co.			2			2
Autocar Sales & Serv Co.			2			2
Bishop & Co.			2			2
Buffalo Brewing Co.		1	1	1		3
Bullock Dept. Store	11		1			12
Burr Creamery		46	10			56
Broadway Dept. Store	7	1	2			10
Caledonia Laundry	6					6
California Laundry		4				4
Capitol Milling Co.				2		2
Christopher Ice Cream					2	2
Cocoa-Cola Bottling Co.			1	2		3
Crescent Creamery			10			10
Le Duxe Laundry	10					10
Electric Vehicle Co.			1		1	2
Franco Am. Baking Co.		2				2
General Electric Co.			1			1
Globe Grain & Milling				2		2
Globe Ice Cream Co.			5			5
Gold Medal Creamery			2			2
O. M. Harris			2			2
Henry Creamery		3				3
Hollywood Laundry	10					10
The May Company		4	2			6
Ice Distributing Co.			4			4
H. Jevne & Co.		5	1			6
Los Angeles Creamery	3	68	18			89
L. A. Ice & Cold Storage			9			9
Los Angeles City		2	15	1		18
Los Angeles Times					1	1
Pacific Baking Corporation		38				38
So. California Tele. Co.		1				1
Union Ice Co.		2				2
White Star Laundry		1				1
Subtotal	47	178	91	8	4	328
Oakland						
Am. Railway Express			12		1	13
Golden Sheaf Remar Bkry.	1	18				19
Southern Pacific Co.			1	1		2
Subtotal	1	18	13	1	1	34
Pasadena						
City Dairy Inc.		2				2
City of Pasadena	1		1	1		3
Mission Laundry Co.	3	1				4
Pasadena Ice & Cold Stor.		7	2			9
Subtotal	4	10	3	1		18
Sacramento						
Capitol Dairy Co.	11	2		1		14
Kave and Trainor		1				1
Liberty Ice Cream				1		1
Pacific Gas and Elec. Co.	1		5		1	7
Thomson-Diggs Co.		1				1
Subtotal	12	4	5	2	1	24
San Francisco						
Am. Railway Express		2		2	3	7
Autocar Sales & Service			1			1
California Baking Corp.	1	21		1		23
Hoffman, Dan E.		1				1
Holt Bros. Co.		1				1
Nat. Ice & Cold Storage	2					2
National Ice Cream Co.			1	9		10
Old Homestead Baking		2	41	1	1	45
Pacific Gas and Elec. Co.		2	5		1	8
Pacific States Electric Co.		1	1	1		3
Pacific Box Factory					2	2
James Smith Co.					1	1
Worth, Chas. J. Co.			1			1
United Milk Co.		1				1
Subtotal	3	31	50	14	8	106
San Diego						
Cramer Baking Co.		2				2
Stockton						
El Dorado Brewing Co.			2		1	3
Gloria Ice Cream Co.		1	1			2
Hedges-Brick Co.		1				1
Holt Manufacturing Co.			1			1
Subtotal		2	4		1	7
Total all electrics in California						556

greater average speed of the electric trucks, the total time required by the gas trucks was 3 hr. more than the electric trucks. It will also be noted that the daily

Table IV—Relative average speed of 2-ton gasoline trucks and 2-ton electric trucks*.

Date	District	No. of Stops	2 Ton Gasoline Truck Daily Miles	Time Hrs.	Av. Sp. MPH	2 Ton Electric Truck Daily Miles	Time Hrs.	Av. Sp.
6-17-24	Vicinity of 17th, Mission..	21	17.0	1.45	11.7	14.2	1.18	12.0
6-18-24	Vicinity of 22d, Fairoaks, etc.	18	20.0	1.83	10.9	16.3	1.55	10.5
6-19-24	Visitacion Valley	13	28.0	2.63	10.7	27.1	2.03	13.3
6-20-24	Visitacion Valley	13	20.0	1.88	10.6	18.3	1.52	12.0
6-21-24	Downtown, South of Market St.	?	16.0	1.63	9.8	12.6	1.22	10.3
6-23-24	Sunset District	25	15.8	1.71	9.3	14.8	1.15	12.9
6-24-24	Sunset, Richmond and Western Addition	23	20.2	1.87	10.8	17.2	1.62	10.6
6-25-24	Western Addition and North Beach..	?	11.5	1.25	9.2	10.2	.97	10.5
6-26-24	Potrero District	?	27.0	1.78	15.2	25.0	1.75	14.3
6-27-24	Visitacion Valley	?	14.0	1.03	13.6	13.9	1.07	13.0
Total and average..			189.5	17.06	11.1	169.6	14.06	12.1

*Note—Both trucks stopped at same points, but did not always travel by exactly the same routes between stopping points.

mileage of the electric trucks varied from 10.2 miles to 27.1 miles, a peak average ratio of nearly 3.1.

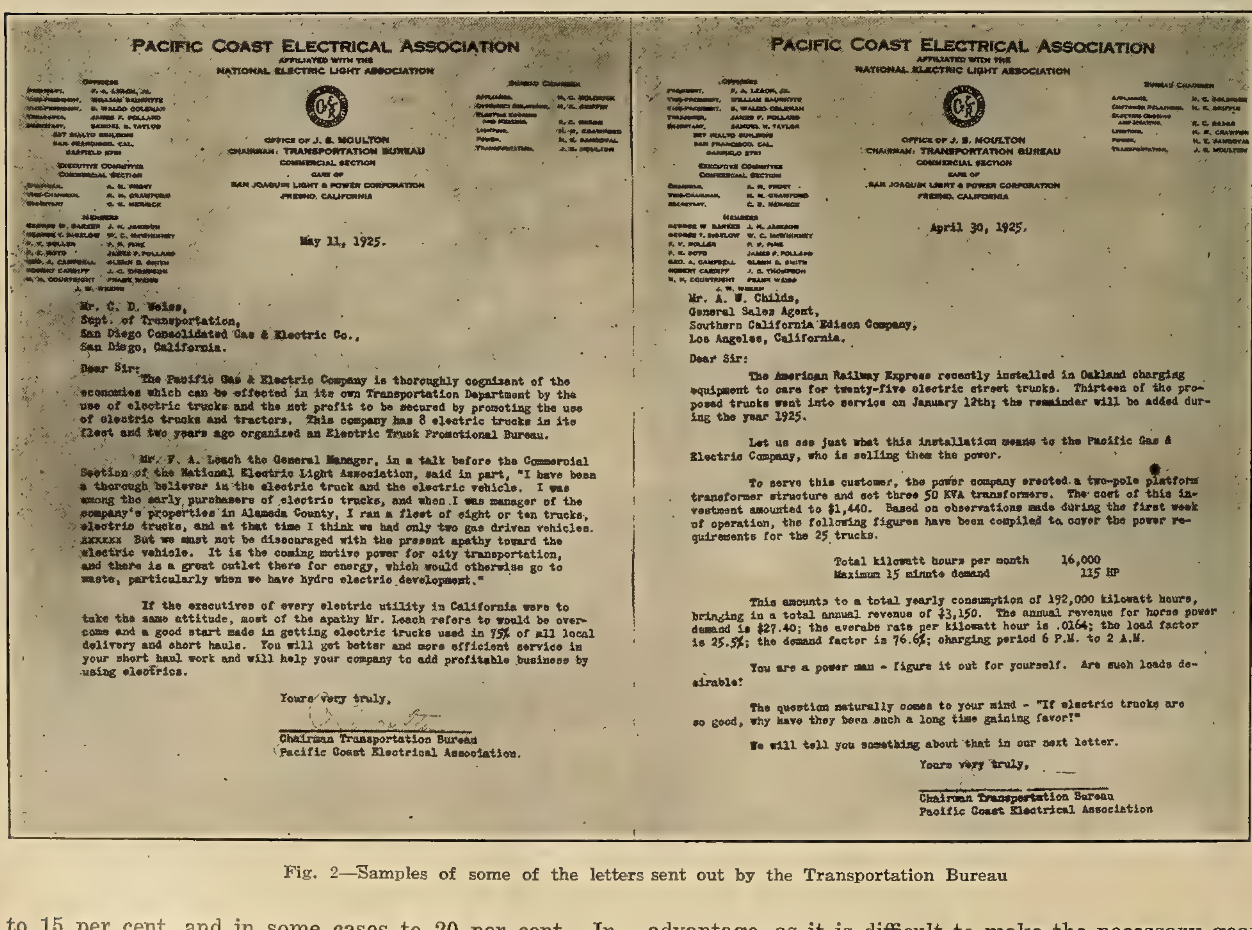
Electric Trucks on Hills

Taking up the question of electric trucks on hills, it has already been noted that the larger cities of the Pacific Coast are quite hilly. This is particularly true of San Francisco, where grades in many cases amount to 15 per cent, and in some cases to 20 per cent. In the past, the feeling has prevailed that these hills interposed an insurmountable barrier to the use of electric trucks. That this is not the case has been demonstrated by the fact that many of the electric trucks in daily use are driven over very hilly routes. The Coca-Cola Bottling Company and the Union Ice Company have each purchased two trucks particularliy for use in the Angels Flight district, the most hilly territory in Los Angeles. These have proved that an electric truck can negotiate any hill that can be negotiated by a gasoline vehicle.

Just as the ability of the gasoline driven vehicle to climb hills is determined by its engine power and gear ratio, so is the ability of the electric truck governed by the size of its motors, the drive gear ratio and the battery capacity of the truck.

Fig. 3 shows the comparative speeds which were obtained by changing the gear ratio and motor voltage of a 2-ton electric truck for various percentages in grade. The electric truck offers great flexibility of operation through the simple changes which can be made very easily and quickly. Such procedure is of considerable advantage where the use of a truck may vary considerably from week to week or month to month.

The data given in Table III indicate that the average speed of an electric truck over routes where hills are involved is practically the same as that of a gas truck. The curves shown in Fig. 4 compare the speed of a typical 2-ton gasoline truck with that of an electric truck of the same capacity that has been motored and batteried for hill work, on various grades up to 20 per cent. It should be noted that the gasoline driven vehicle is governed at slightly under 20 miles per hour, which is considered good practice, both from the standpoint of safety and economy. As indicated by the curves, the gasoline driven vehicle has considerably greater speed on the straight-away running, but when it is compelled to operate in the lower gears, it is handicapped by lack of flexibility, so that the electric truck is often able to climb hills of 5 per cent gradient and more, at a greater rate of speed than is the gas truck. When traffic conditions are involved together with hills the gas truck operates at a still greater disadvantage, as it is difficult to make the necessary gear shifts to obtain the highest possible operating speed on the grade.



PACIFIC COAST ELECTRICAL ASSOCIATION
AFFILIATED WITH THE NATIONAL ELECTRIC LIGHT ASSOCIATION

OFFICE OF J. S. MOULTON
CHAIRMAN: TRANSPORTATION BUREAU
COMMERCIAL SECTION
CARE OF
SAN JOAQUIN LIGHT & POWER CORPORATION
FRESNO, CALIFORNIA

May 11, 1925.

Mr. C. D. Weiss,
Sept. of Transportation,
San Diego Consolidated Gas & Electric Co.,
San Diego, California.

Dear Sir:

The Pacific Gas & Electric Company is thoroughly cognizant of the economies which can be effected in its own Transportation Department by the use of electric trucks and the net profit to be secured by promoting the use of electric trucks and tractors. This company has 8 electric trucks in its fleet and two years ago organized an Electric Truck Promotional Bureau.

Mr. F. A. Leach the General Manager, in a talk before the Commercial Section of the National Electric Light Association, said in part, "I have been a thorough believer in the electric truck and the electric vehicle. I was among the early purchasers of electric trucks, and when I was manager of the company's properties in Alameda County, I ran a fleet of eight or ten trucks, electric trucks, and at that time I think we had only two gas driven vehicles. xxxxxx But we must not be discouraged with the present apathy toward the electric vehicle. It is the coming motive power for city transportation, and there is a great outlet there for energy, which would otherwise go to waste, particularly when we have hydro electric development."

If the executives of every electric utility in California were to take the same attitude, most of the apathy Mr. Leach refers to would be overcome and a good start made in getting electric trucks used in 75% of all local delivery and short hauls. You will get better and more efficient service in your short haul work and will help your company to add profitable business by using electrics.

Yours very truly,

Chairman Transportation Bureau
Pacific Coast Electrical Association.

PACIFIC COAST ELECTRICAL ASSOCIATION
AFFILIATED WITH THE NATIONAL ELECTRIC LIGHT ASSOCIATION

OFFICE OF J. S. MOULTON
CHAIRMAN: TRANSPORTATION BUREAU
COMMERCIAL SECTION
CARE OF
SAN JOAQUIN LIGHT & POWER CORPORATION
FRESNO, CALIFORNIA

April 30, 1925.

Mr. A. W. Childs,
General Sales Agent,
Southern California Edison Company,
Los Angeles, California.

Dear Sir:

The American Railway Express recently installed in Oakland charging equipment to care for twenty-five electric street trucks. Thirteen of the proposed trucks went into service on January 12th; the remainder will be added during the year 1925.

Let us see just what this installation means to the Pacific Gas & Electric Company, who is selling them the power.

To serve this customer, the power company erected a two-pole platform transformer structure and set three 50 KVA transformers. The cost of this investment amounted to $1,440. Based on observations made during the first week of operation, the following figures have been compiled to cover the power requirements for the 25 trucks.

Total kilowatt hours per month 16,000
Maximum 15 minute demand 115 HP

This amounts to a total yearly consumption of 192,000 kilowatt hours, bringing in a total annual revenue of $3,150. The annual revenue for horse power demand is $27.40; the averabe rate per kilowatt hour is .0164; the load factor is 25.5%; the demand factor is 76.6%; charging period 6 P.M. to 2 A.M.

You are a power man - figure it out for yourself. Are such loads desirable?

The question naturally comes to your mind - "If electric trucks are so good, why have they been such a long time gaining favor?"

We will tell you something about that in our next letter.

Yours very truly,

Chairman Transportation Bureau
Pacific Coast Electrical Association

Fig. 2—Samples of some of the letters sent out by the Transportation Bureau

Future of Electric Trucks

Referring to the question of street conditions, it may be said that these are being rapidly improved and a greater percentage of hard, smooth paving is being

used in connection with city streets.

In addition to this, certain truck manufacturers are now furnishing equipment which is provided with under-axle clearance equal to that of the gasoline driven vehicles, so that in case the streets are in particularly bad shape in certain seasons of the year equipment of that type can be used.

Referring to the question of lack of promotion which has existed in the past in connection with the electric truck, it may be stated that the past two years have been marked by the entrance of a number of manufacturers' representatives who have been very active in promoting the sales of electric trucks. The Transportation Bureau is also reaching the close of its second year of existence. The power companies also have taken a more active interest in this work. The results of this greater activity in sales promotion are beginning to be felt.

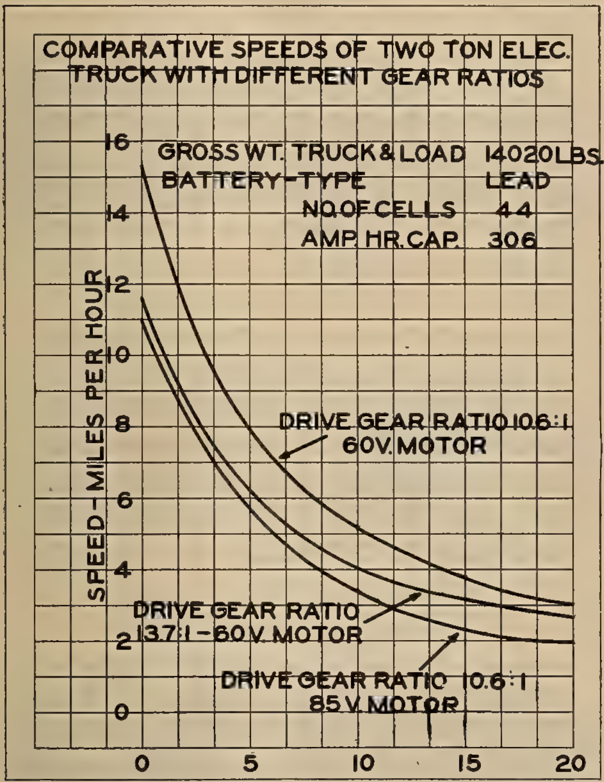


Fig. 3—Comparative speeds of 2-ton electric truck with different gear ratios

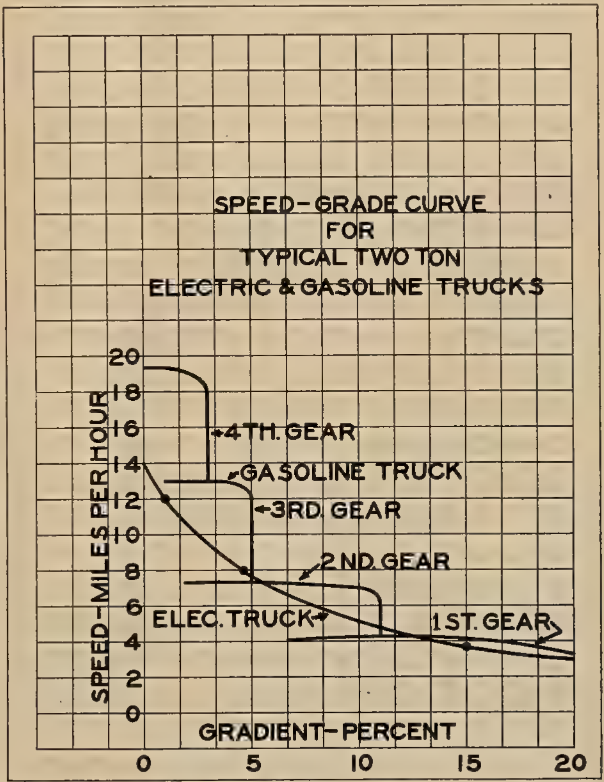


Fig. 4—Speed-grade curve for typical 2-ton electric and gasoline trucks

While the field to which the electric truck is most readily applicable is that already mentioned, the regular frequent-stop delivery route, there is a wide field for its application in non-route general delivery work, and other classes of short-haul work, particularly where traffic density is heavy.

On this latter class of work, particular attention must be paid to the selection of battery equipment, in order to provide for the peak-day's mileage. The ratio of peak-day's mileage to average daily mileage may be as great as 3.1. Furthermore, unless the vehicle can be given a boosting charge during the day, it must be equipped with a battery of ample capacity for the peak-day's work. Much of the work of power companies and other public utilities is in this class, which has to a considerable extent accounted for their apparent unwillingness to use electric trucks in their own service. However, time and experience, together with a careful study of the transportation problem with respect to possible zoning and routing of work, should indicate that a considerable portion of their work can be done more economically with the electric truck than with other types of transportation equipment, particularly in larger centers of population.

While the year 1924 was one in which the transportation facilities of California industries were not expanded very extensively, the electric truck field of application was somewhat broadened by the entrance of a number of new users. Perhaps the most notable among these was the American Railway Express Company. Although that company had probably been the largest user of electric trucks in the world, they had not used them in California until they made their initial installation of thirteen electric trucks at Oakland.

The Pacific Telephone & Telegraph Company also, while not undertaking the use of electric trucks on the same scale as the American Railway Express Company, has after a careful study of their application to its work placed electric trucks in service for observation.

A number of other potential users have manifested considerable interest in the electric truck, and may conclude to make their initial trials at any time.

Among the power companies, the Pacific Gas and Electric Company has continued its investigation of transportation operations and has increased its electric truck fleet, as has the Los Angeles Bureau of Power and Light. Other power companies are continuing the use of electric trucks and expanding their fleets as necessity arises. (See Figs. 5, 6 and 7.)

Value of Battery Charging Load

The value of the load offered central stations by the charging requirements of electric street and industrial trucks is almost too well known to need repetition. There is one phase of the matter, however, which requires attention. In many industries the trucks go to the garage between 5 and 6 o'clock in the evening and unless there is a particular advantage to be gained by not putting them on charge immediately, this will be done. The upper curve of Fig. 8 shows a typical summer load curve of the San Joaquin Light & Power Corporation, showing the battery charging load of its 7 trucks increased 500 times and directly superimposed on the load curve. It will be noted in this particular case that a small amount of battery charging load would not increase the evening peak above that of the morning peak. This condition will not hold for the majority of companies for which the evening peak determines the system peak capacity. The lower curve of the same figure shows the same battery charging load starting at 10 p.m. This shows how the battery charging load coming on at a later period fits into the valley of the load curve, meaning that it can be supplied without utilizing any peak capacity and at a time when light load on the system means very low line losses.

Operating Costs

The committee has continued to collect electric truck cost data as a basis for determining relative cost of operation of electric trucks and gasoline driven vehicles under comparable conditions.

There are a number of difficulties which have presented themselves in this work, such as the fact that many users do not keep cost records and of those that do so, it is difficult to find two who keep them in similar form so that comparative data can be obtained. Unless cost data is truly comparative, it may be very misleading. Thus, it would be obviously unfair to compare operating costs of **old** gasoline vehicles with those of **new** electric vehicles, and vice versa. Similarly, the cost of operating trucks in one city may not be comparable with that in another city, where conditions may vary considerably. The character of roads, hills and types of bodies used also affect costs. For this reason, it is not believed that the cost data that the committee has on hand is of very great value for making comparisons of cost on mileage or other unit basis. However, from this data, and from the experience of truck operators generally, certain approximate relations for estimating the comparative cost of gasoline and electric truck equipment under similar conditions has been deduced. This may be stated as follows:

1.—Repairs to chassis and body, including painting. The cost for the electric truck will vary from 25 per cent to 50 per cent of the cost for the gasoline truck, the lower value being used where routes have frequent starts and stops and severe hills to negotiate.

2—Tires. The cost of tires for an electric truck will approximate 60 per cent to 90 per cent of the cost of the gasoline truck.

3—Charging Current and Battery Renewals. The cost of charging current (based on an estimated cost of 2 cents per kw-hr.), plus battery renewals, will approximately equal the cost of gasoline and oil for gasoline trucks of same capacity on similar work, with gasoline at 20 cents per gal.

4—Servicing and Garage Expense. For fleets of comparable size and equally well serviced, the cost for electric and gasoline trucks will probably be about the same, but with a decided tendency favoring the electric.

5—Insurance, Licenses, Taxes, etc. Insurance is generally lower for the electric truck and electric truck garages. The present license rates are higher in California for electric trucks than for gasoline trucks, if gasoline tax is included in cost of fuel. The total for these items, including taxes, will probably be about the same in both cases.

6—Interest and Depreciation. Here, on account of the somewhat higher costs of electric trucks (including batteries) the item of interest will be higher than for the gasoline truck. The electric truck, however, will have a considerably longer economic life and the lower consequent depreciation rate will more than offset the higher interest charge. The interest and depreciation cost will average 10 per cent to 20 per cent less for the electric truck than for the gasoline truck.

7—Other Items. Such items of cost as investment in charging equipment for the electric truck will be offset by cost of shops and shop equipment parts, stock, etc., used in repairing the gasoline truck.

Assuming a percentage distribution of cost of gasoline truck operation as noted in Table V and applying the above ratios to the same we can arrive at an approximate relative cost for electric and gasoline truck fleets.

Table V—Comparative Cost of Gasoline and Electric Truck Operation

Item of Cost	Gasoline Trucks: Per Cent of Total	Electric Trucks: Ratio to Gasoline (%)	Electric Trucks: Per Cent of Gasoline Total	
Repairs	23	25-50	5.75	11.50
Tires	7	60-90	4.20	6.30
Fuel or current and battery renewals	17	100	17.00	17.00
Servicing, etc.	7	100	7.00	7.00
Insurance	13	100	13.00	13.00
Interest and depreciation	33	80-90	26.40	29.70
	100		73.35	84.50

Thus, the cost of operation of electric trucks per unit of time or mileage on the same work will approximate from about 75 per cent to 85 per cent of the cost for gasoline vehicles of comparable size.

INDUSTRIAL TRUCK COMMITTEE

The electric industrial truck and tractor has enjoyed a great increase in use on the Pacific Coast, particularly in the last two or three years. The two chief reasons for this increased use are:

1—Freedom from competition.

2—Elimination of labor.

Generally speaking, the electric industrial truck is not in keen competition with gasoline trucks and tractors

Fig. 5—Fleet of electric trucks used by the San Joaquin Light & Power Corporation

or other types of mechanical devices for transporting materials in and around factories and warehouses. In most uses of this kind the danger from fire, the noise and the difficulty of successfully meeting requirements has prevented the use of gasoline trucks and tractors. The motor operated or gravity conveyor can be used in specific instances where material is continuously moved from a single definite point to another single and definite point. The use of conveyors is eliminated when flexibility of movement is required. For use around plants or in storage yards where roadways are either entirely lacking or are of very poor construction, the gasoline tractor is the electric's greatest competitor. The lumber and brick industries are good

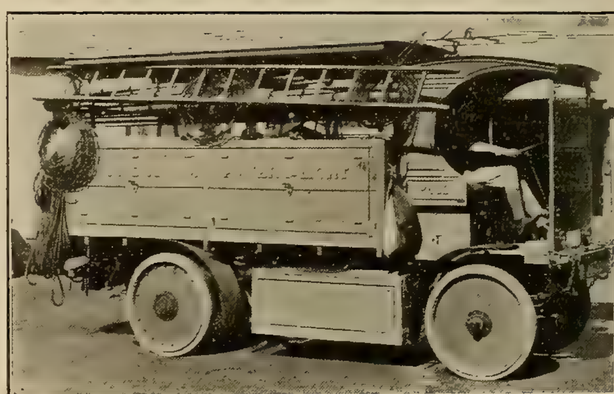


Fig. 6—One of the electrics used by the Los Angeles Bureau of Power and Light

examples of this type of use. Even in these industries, however, the electric is gaining in popularity, as is evinced by the fact that in California alone 26 trucks are used in the brick industry and 17 in the lumber industry. Of these, 8 have been placed in service during the six months ending Feb. 1, 1925.

The second reason for the increasing use of industrial trucks is due to the necessity in many organizations of reducing operating costs to a minimum in order to meet keen competition and to eliminate unnecessary expenditures for labor. It is this necessity which has been the reason for the introduction of practically all machinery. The use of labor saving devices for transporting materials short distances in and around industrial plants has not kept pace with other lines of machinery, and consequently still has a tremendous field open to it.

The industrial truck and tractor by eliminating labor, makes a definite showing on the payroll of the user and does not have to rely for its justification on saving in operating costs for the equipment itself, as is the

case of the electric street truck when compared to the gasoline truck.

Types In Use

The industrial truck and tractor is broadly divided into five groups:

1—Tractor
2—Truck.
3—Light truck.
4—Elevating or tiering truck.
5—Crane truck.

The tractor is used for hauling other trucks and has no space for carrying load itself. This type is used considerably in railroad terminals for handling express and baggage and in lumber mills for hauling wheeled platforms loaded with lumber.

The industrial truck with a load carrying platform is used to some extent for handling material which is loaded directly on to the truck and removed at the destination.

Fig. 7—Fleet of four new electric trucks just purchased by the Los Angeles Bureau of Power and Light

This type has been largely superseded by the lift truck which has a platform which can be raised or lowered several inches. Material to be moved is loaded on a small platform constructed in such a way that the lifting platform of the truck can be run under it and raised, lifting the material and its platform off the floor or ground. When the material has been carried to its destination, the process is reversed, leaving the material and its platform for unloading without tying up the electric truck. The use of many platforms enables the electric truck to be kept constantly on the move, which is very desirable.

A modification of the lift truck has been more recently developed with a platform which can be raised several feet. This type of truck is particularly convenient where material is to be stacked, as the transporting and the stacking operations may be performed by the single truck.

The industrial crane has also been developed in recent years to meet the demand for a small portable crane for handling materials which cannot be conveniently loaded on platforms.

Modification of these five types are in use for special purposes. The industrial truck because of its extreme simplicity can be designed for a great number of particular purposes with but very small additional cost.

Operating Costs

It is extremely difficult to secure operating costs and statistics as most of the concerns using these trucks either do not like to give out cost figures if they are kept, or do not bother to keep them. Many concerns, after investigation, are convinced that the use of electric trucks or tractors will reduce the labor required and will effect considerable saving. When these trucks are installed, the saving in payroll is immediately apparent, and consequently no further costs are kept.

Table VI shows a comparative test of unloading a vessel with electric trucks and with hand trucks. The electric truck shows a cost for labor of 10.4 per cent per ton moved, compared to 19.7 per cent per ton for labor with hand trucks. The saving of almost 50 per

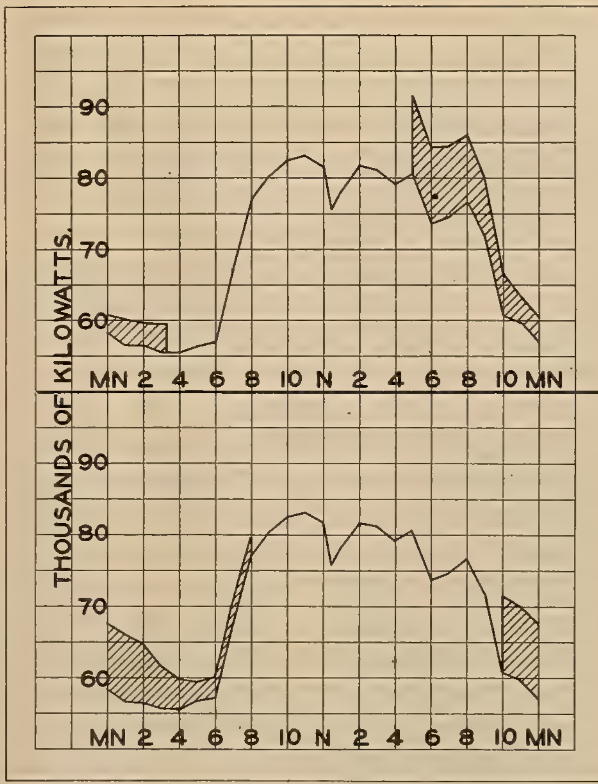


Fig. 8—Typical summer daily load curve of San Joaquin Light & Power Corporation with present charging load multiplied by 500 superimposed on present curve. Upper curve shows load coming on at 5 p.m. and lower with load coming on at 10 p.m.

cent is indicative of the wide margin available for paying interest, depreciation and operating cost of the electric truck.

Table VI—Cost of Unloading Eight Cars of Solid Freight from S. S. St. Louis Discharging at Savannah, Monday, June 9th, by Using Electric Trucks, Compared with Same Service Performed by Hand Trucks.

		Cost Per Ton
350 cases fuse—from ship to dock	11 tons	
3 motor truck drivers and 4 laborers ¾ hr.	$1.05	9½c
By hand trucks 18 laborers ¾ hr.	2.50	22¾c
224 cases and 25 bags coffee—to car	13 tons	
3 motor truck drivers and 8 laborers ½ hr.	$1.14	8c
By hand trucks 20 laborers ½ hr.	1.84	14c
300 bags fertilizer—to car	15 tons	
3 motor truck drivers and 8 laborers ¾ hr.	$1.71	11½c
By hand trucks 20 laborers ¾ hr.	2.76	18½c
260 bags and 22 barrels sulphur—to car	16 tons	
3 motor truck drivers and 8 laborers ½ hr.	$1.14	7.12c
By hand trucks 20 laborers ½ hr.	1.84	11½c
400 bags sugar—to car	20 tons	
3 motor truck drivers and 8 laborers ¾ hr.	$1.71	8.55c
By hand trucks 25 laborers ¾ hr.	3.44	17½c
225 bags flour—to dock	11 tons	
3 motor truck drivers and 8 laborers ½ hr.	$1.14	10½c
By hand trucks 25 laborers ½ hr.	2.30	21c
300 sacks rice—to dock	15 tons	
3 motor truck drivers and 8 laborers 1 hr.	$2.28	15½c
By hand trucks 20 laborers 1 hr.	3.68	24½c
463 rolls roofing paper—to car	15 tons	
3 motor truck drivers and 8 laborers ¾ hr.	$1.71	11½c
By hand truck 20 laborers ¾ hr.	2.76	18½c
Average cost of labor for electric trucks	10.4c per ton	
Average cost of labor for hand trucks	19.7c per ton	

Table VII shows a test made by the Matson Navigation Company of San Francisco. This company uses 47 industrial trucks and tractors which is proof positive of the saving in labor made possible by their use.

Table VII—Comparison of Cost of Freight Handling Between Electric Trucks and Hand Trucks on Matson Navigation Company's Dock.

Time Required	Number of Cases Moved	Distance Moved	Cars Loaded	Cost
11 Men with Hand Trucks				
1 hr. 55 min.	1,050	500 ft.	1	$13.20
9 Men with 1 Electric Truck				
1 hr. 10 min.	1,140	400 ft	1	$ 7.06

It may be well to mention at this point the extreme simplicity of the electric truck and tractor which makes possible its use by the same unskilled labor that is

commonly employed when hand trucks are used. This class of labor displays little care and skill in operating machinery, which means that electric industrial trucks are almost universally subjected to abuse. This is particularly true in steamship and stevedoring, lumber mills, brick and clay products industries, glass industry and metal manufacture and to a lesser extent in most other industries. It is only by reason of the extremely rugged and simple construction of the industrial truck that the characteristic efficiency of these devices is at all possible.

Battery Charging Load

The average industrial truck will consume from 10 to 12 kw-hr. per 8 hr. of operation and the tractor from 15 to 17 kw-hr. In a number of industries, the use of two sets of batteries makes possible the use of this equipment 24 hr. a day, which will practically triple the current consumption. In places where duplicate sets of batteries are used to enable the truck to be used 24 hr. a day, the charging load is practically continuous which makes it much more desirable because of its high load factor than the average industrial power application. The majority of users, however, employ the truck from 8 to 12 hr. a day, leaving only the night hours available for charging the battery. Under these circumstances, the same tremendous advantage that the electric street truck charging load offers in the development of off-peak power loads are present. The advantages the power companies will secure by the development of battery charging load have already been enumerated in connection with the electric street truck and their repetition here is needless.

Table VIII shows the total number of industrial trucks used in California segregated by industries.

Table VIII—Electric Industrial Trucks and Tractors In California Classified by Industries

Mar. 1, 1925

Automobile and tractor factories	18
Clay products	21
Fruit packers and sugar refineries	26
Grain and milling industries	14
Lumber industries	17
Manufacturers, jobbers, miscellaneous	67
Oil refineries	16
Shipyards	14
Steel and metal products	19
Terminal, freight, express, etc	162
Total in use Mar. 1, 1925	374

The detail list of the firms using industrial trucks and tractors and the number of these trucks which have been added during the six months ending Mar. 1, 1925, is shown in Table IX.

Table IX—California Users of Industrial Trucks

American Steel & Wire Company	4
Albers Bros. Milling Company, Oakland	2
American Can Company, Los Angeles	2
American Can Company, Oakland	3
American Can Company, San Jose	3
American Can Company, San Francisco	2
American Encaustic Tiling Company	2
American Railway Express	10
Associated Terminals Company	1
A. T. & S. F. Railroad Company, Los Angeles	4
A. T. & S. F. Railroad Company, Richmond	2
A. T. & S. F. Railroad Company, San Bernardino	10
Associated Oil Company	3
Bethlehem Shipbuilding Corporation, Ltd., Alameda	3
Bethlehem Shipbuilding Corporation, Ltd., San Francisco	11
Banning Company, The	1
Bay Cities Transportation Company	4
Best Tractor Company, C. L.	5
California Brick Company	1
California Hawaiian Sugar Company	5
Chevrolet Motor Car Company	2
California Associated Raisin Company	2
California Packing Corporation, San Francisco	1
California Packing Corporation, Sacramento	2
California Packing Corporation, Honolulu	1
Coast Tire & Rubber Company	1
California Wire Cloth Company	1
California Hawaiian Sugar Refining Company	5
City of Richmond, Harbor Department	2
Davidson Brick Company	4
Durant Motors Company of California	1
Edwards Company, E. H.	2
Fruit Growers Supply Company	2
Fuller & Company, W. P.	2
Gladding McBean & Company	7
General Electric Company, Oakland	1
Giant Powder Company	1
Graves Sash & Mill Company, Frank	1
Goodyear Tire & Rubber Company	1
Great Western Milling Company	1
Harbor Board, San Francisco	2
Harbor Board, Richmond	2
Hawaiian Pinapple Company, Ltd.	2
Holt Manufacturing Company	10
Hammond Lumber Company, Eureka	2
Hammond Lumber Company, Los Angeles	1
Hamburger Department Store, Los Angeles	1
Illinois Pacific Glass Company	2
Inter-Island Steam Navigation Company, Honolulu	2
Judson Manufacturing Company	3
Los Angeles Pressed Brick Company	3
Luckenbach Steamship Company	2
Los Angeles Drydock Company	3
Libby, McNeill & Libby, Sacramento	2
Matson Navigation Company, San Francisco	42
McCloud River Lumber Company	2
National Paper Products Company	5
National Lead Company	2
Oceanic Steamship Company	4
Oakland Mazda Lamp Division	1
Outer Harbor Dock & Ward Company	4
Pacific Steamship Company, San Francisco	14
Pacific Electric Company	2
Pacific Mail Steamship Company	4
Pacific Steamship Company, Los Angeles	11
Pacific Telephone & Telegraph Company, Los Angeles	1
Paraffine Paint Company	3
Parr Terminal Company	2
P-K Brick Company	3
Patton and Davis Lumber Company	1
Pioneer Paper Company	3
Pacific Bone Coal & Fertilizer Company	2
Pacific Guano & Fertilizer Company	3
Port Costa Warehouse Company	1
Pottenger Sanitorium, Los Angeles	1
Pullman Company	1
Pacific Gas and Electric Company, Emeryville	2
Pacific Clay Products Company, Los Angeles	3
Pacific Lumber Company	1
Rosenberg Bros.	3
Roscoe Moss Company	2
Richmond Pressed Brick Company	1
Sacramento Transportation Company	1
Schirmer Stevedoring Company	1
Simons Brick Company	3
Sugar Pine Lumber Company, Fresno	7
Sperry Flour Company	6
Standard Oil Company, El Segunda	3
Standard Oil Company, Richmond	10
Southern Pacific Company	6
Santa Monica Tram Company	8
State of California Department of Printing	1
U. S. Navy Bureau of Supplies and Accounts	2
Union Pacific Salt Company	1
Union Tool Company	2
United Studio	1
U. S. Army Air Station, North Island, San Diego	3
Union Terminal Warehouse Company	2
U. S. Army Transport Dock	5
U. S. Arsenal, Benicia	12
U. S. Navy Yard	12
U. S. Naval Air Station, North Island, San Diego	9
Western Sugar Refinery	1
	374

It is generally believed that there will be a greatly increasing use made of the industrial truck, as the Pacific Coast industries are constantly increasing in size and the necessity for keeping payrolls at a minimum is more widely appreciated. The electric utilities are beginning to appreciate the value of off-peak load and are cooperating with the truck distributors in a program of education which it is hoped will help place many more industrial trucks in use on the Coast.

APPENDIX

Executive Letters

No. 1.

April 8, 1925

Dear Sir:

We wired you April 6th as follows:

"Transportation Bureau of Pacific Coast Electrical Association after thorough investigation of electric trucks and tractors, urges your serious consideration of this desirable load as well as application in your own service. Please give personal attention to letters which follow."

In furnishing financial aid and in outlining the research work of this bureau, our understanding is that the executives of the member companies of the Pacific Coast Electrical Association wished an unbiased report on electric trucks and tractors as a medium for making a saving within their companies and opening a source of additional revenue. We have tried to cover this matter from its various angles and analyse not onnly the possibilities, but outline some of the difficulties in application.

We believe that executive action is necessary within the electric service companies to so systematize their transportation that the savings possible by the use of electric trucks may become an actuality. The use of electric trucks is of great importance as an example in encouraging the buying public to make proper and economical installations of transportation units.

We have prepared information showing the net profits accruing to electric service companies through the use of electric trucks and the revenue from the battery charging load. This will be sent to you shortly.

Yours very truly,

Chairman Transportation Bureau
Pacific Coast Electrical Association.

No. 2

April 13, 1925

Dear Sir:

You, as an executive, are interested in the net profit your company would earn by sponsoring electric trucks.

Among the advantages you would gain under such a program are the following:

1—Increased revenue—one electric truck will use as many kilowatt hours per year as twenty average residences.

2—Economy—and therefore greater profits—of servicing one customer as against twenty or more.

3—Diversity—the battery charging load is usually off-peak and will not require additional generating transmission and substation facilities.

4—Popularizing of electricity—every electric truck advertises electricity.

5—Advocating lower delivery costs is in keeping with your leadership in community and business affairs.

6—Using electric trucks on your frequent-stop jobs will set a good example and will cut your operating cost, placing your transportation department on the most economical basis.

Please give these thoughts your careful consideration.

Yours very truly,

Chairman Transportation Bureau
Pacific Coast Electrical Association.

No. 3

April 16, 1925

Dear Sir:

In our previous letter, we told you that the use of electric trucks by your company would not only be a good example, but would also cut your transportation costs in your city work.

The consensus of opinion among scores of industrial and business executives interviewed is that 75 per cent of all local delivery and short-haul routes can be more efficiently and more profitably handled by electric trucks.

Why not ask the head of your transportation department for a report giving definite reasons for not using electric trucks? We are supplying him with data on their application and stand ready to assist in any further studies you wish to make of your particular situation.

Yours very truly,

Chairman Transportation Bureau
Pacific Coast Electrical Association.

No. 4

April 20, 1925

Dear Sir:

The potential market for electric trucks existing in your community will surprise you. Using the recognized premise, as outlined in our letter of April 16th, 75 per cent of all local delivery, short-haul routes can be more efficiently and more profitably handled by electric trucks than either gasoline trucks or horse-drawn vehicles.

What would it mean to you if this potential field were saturated? 6,000 to 10,000 kw-hr. annually in current consumption will be realized from each electric truck in service. Figure how this would fill up the valley of your present load curve.

Yours very truly,

Chairman Transportation Bureau
Pacific Coast Electrical Association.

No. 5

April 23, 1925

Dear Sir:

Detail investigations of current consumed by the average electric truck show that annually it consumes the amount of current which would be required to operate the following number of appliances:

280 vacuum cleaners, or 760 warming pads, or 500 sewing machines, or 550 fans, or 310 washing machines, or 225 toasters.

Is this not convincing proof of the profit to be derived from servicing a single electric truck against a group of these other appliances. You know how much money has been spent on campaigns to increase the use of household appliances. Are you overlooking the profit to be derived from the super-appliance—the electric truck?

Yours very truly,

Chairman Transportation Bureau
Pacific Coast Electrical Association.

No. 6

April 27, 1925

Dear Sir:

Our records show that of the 556 electric street trucks in the state, 104 are being charged from the lines of your company. This does not include industrial trucks in the state. Each of these trucks uses from 6,000 to 10,000 kw-hr. annually, probably twenty times that used by the average residential lighting consumer. Much of the residential lighting use comes during peak hours and ties up capital in generating, transmitting, and substation facilities. The electric truck load is, or can easily be made, off peak. This load, as soon as the cost of servicing is repaid, can be supplied from off-peak hydro at no cost, or from existing steam plants for the cost of fuel and maintenance only.

The Pacific Gas and Electric Company are supplying power for charging the fleet of thirteen electric trucks recently placed in the city of Oakland by the American Railway Express Company. The cost of service to this installation of $1,440 will be entirely recovered in 7½ months' operation. As soon as the entire fleet or 25 trucks now planned is in operation, the estimated monthly revenue for this off-peak power will be $334.

Yours very truly,

Chairman Transportation Bureau
Pacific Coast Electrical Association.

No. 7

April 30, 1925

Dear Sir:

After assuring yourself that the net profits of your company are yielding a fair return upon the invested capital, your next concern is rendering the consumer the best possible service at the lowest possible cost. The more nearly you are able to fit the demand for power to the potential output of your generating plants, the more nearly will your generators and lines be continuously loaded and the lower will it be possible to make the rates for all kinds of electric service.

You are attempting to fit your seasonal power demand to your potential power resources by the development of seasonal load, such as winter irrigation. Your daily load factor will be improved by filling up each night's valley. The charging load of electric trucks and tractors will fill this valley better than any other known load.

Yours very truly,

Chairman Transportation Bureau
Pacific Coast Electrical Association.

No. 8

May 4, 1925

Dear Sir:

A baker would say, "The proof of the pudding is in the eating." Electric utility executives would probably paraphrase this to read: "The proof of an appliance is in the using." The following list shows the electric trucks and tractors which are in use in California today:

Electric Street Trucks	
Ice Cream	28
Creameries and dairies	200
Laundries	35
Ice companies	28
Baking companies	129
Express companies	20
Department stores	34
Mercantile stores	14
Public utilities	42
Soft drink mfg.	9
Grain and milling	4
Municipalities	4
Miscellaneous	9
Total in use Mar. 1, 1925	556

Electric Industrial Truck and Tractors	
Automobile and tractor factories	18
Glay products	21
Fruit packers and sugar refineries	26
Grain and milling industries	14
Lumber industries	17
Manufacturers, jobbers, miscellaneous	67
Oil refineries	16
Shipyards	14
Steel and metal products	19
Terminal, freight, expres., etc.	162
Total in use Mar. 1, 1025	374

All reports indicate increasing interest in the economies effected by electric trucks and tractors. When you realize that each of these 930 units consumes from 6,000 to 10,000 kw-hr. of off-peak power, the net profit thus derived is seen to be surprisingly large.

Yours very truly,

Chairman Transportation Bureau
Pacific Coast Electrical Association.

No. 9

May 7, 1925

Dear Sir:

When distances are to be covered within a radius of 30 to 35 miles, particularly in city work where stops are frequent because of traffic conditions, the speed factor of the gasoline truck loses its value and instead becomes inefficient and costly. The many stops cut down the high maximum speed to a comparatively low average speed, while gasoline consumption is increased with each stop and start.

Statistics from tests made by the Post Master General"s office show that where there is frequent starting and stopping, the gasoline consumption is three or four times as great as on long hauls with few stops. For just such uses where costs increase in gasoline truck operation, the electric truck is the logical delivery unit to use. Its characteristics are just a reverse of those of the gasoline truck. Its ease of handling and rapid acceleration makes a high average speed possible through congested traffic or when making many stops. The motor does not idle when the truck is standing nor is there a clutch and transmission to receive severe trials at each start.

Yours very truly,

Chairman Transportation Bureau
Pacific Coast Electrical Association.

No. 10

May 11, 1925

Dear Sir:

You have perhaps wondered just what was the attitude of the American Railway Express Company, known throughout the country as the largest user of truck equipment and a most discriminating buyer. This company's attitude is expressed in the following statement by Mr. E. E. La Schum, who is general superintendent in charge of motor equipment: "From our experience and observation, we are firmly convinced that in its particuuar field, the electric truck is the most economical, reliable and efficient vehicle in operation today."

Mr. Robert E. M. Cowie, president of the same company, has stated: "The advantages secured by the use of electric trucks on short haul or frequent stop routes may be briefly recapitulated as follows, and these, gentlemen, are the main reasons why the American Railway Express Company is today using 1,800 electric vehicles:

1—Electric trucks greatly reduce costs.

2—They are the fastest trucks there are on short haul or frequent stop routes.

3—The electric's simplicity makes it easy to run and easy to repair.

4—It is rugged and reliable, seldom breaking down on the road and becoming disabled less frequently than any other type of vehicle.

5—Electric trucks last a good deal longer than gas trucks.
6—The electric truck is clean, insuring immaculate and sanitary conditions for the goods it conveys.
7—The electric truck is quiet.
8—The electric truck is odorless.
9—It can be stored at loading platform, saving garage space.
10—It uses power with the minimum of waste.
11—It has all the speed that is consistent with prudence in city running and power economy.
12—Employee's control of the speed is inherent in the truck.
13—Its tractive power is greatest in proportion to the horse-power used.
14—Its hazard of fire, accidents and theft is lowest.
15—Its cost is less to run and maintain.

Those are the specific reasons for our selection of 1,800 electric vehicle—and those fifteen points which I have enumerated are certainly worthy of the consideration of every intelligent executive in business."

Should not the statements of executives of a concern, whose sole business is transportation, be conclusive evidence?

Yours very truly,
Chairman Transportation Bureau
Pacific Coast Electrical Association.

No. 11

May 18, 1925

Dear Sir:

The Pacific Gas and Electric Company is thoroughly cognizant of the economies which can be effected in its own transportation department by the use of electric trucks and the net profit to be secured in promoting the use of electric trucks and tractors. This company has eight electric trucks in its fleet and two years ago organized an Electric Truck Promotional Bureau.

Mr. F. A. Leach, the general manager, in a talk before the Commercial Section of the National Electric Light Association, said in part: "I have been a thorough believer in the electric truck and the electric vehicle. I was among the early purchasers of electric trucks and when I was manager of the company's properties in Alameda County, I ran a fleet of eight or ten trucks, electric trucks, and at that time I think we had only two gas driven vehicles. But we must not be discouraged with the present apathy toward the electric vehicle. It is the coming motive power for city transportation, and there is a great outlet there for energy, which would otherwise go to waste, particularly when we have hydro electric development."

If the executives of every electric utility in California were to take the same attitude, most of the apathy Mr. Leach refers to would be overcome and a good start made in getting electric trucks used in 75 per cent of all local delivery and short hauls. This figure has been set by experts after thorough investigation as the quota for city delivery work which can be most economically handled by the electric vehicle.

Yours very truly,
Chairman Transportation Bureau
Pacific Coast Electrical Association.

No. 12

May 25, 1925

Dear Sir:

You have been receiving "facts" in the past few weeks with reference to the electric truck as a possible revenue producer for your company.

The question now in your mind, "How can my company best organize to promote the sale of electric trucks?" This question can perhaps be answered best by giving you the method adopted by central stations promoting the electric truck and tractor. This has been done by the formation of an electric truck promotional bureau in the larger cities and by the assignment of a particular salesman to devote all or part of his time to this work in the smaller centers.

In adopting this method, you are following in the path of proven experience and success should attend your efforts in this direction. Our next letter will detail some of the functions of this bureau or individual salesman.

Yours very truly,
Chairman Transportation Bureau
Pacific Coast Electrical Association.

No. 13

June 1, 1925

Dear Sir:

In our previous letter we suggested that you organize an electric truck promotional bureau, or have an individual salesman assigned this work. There are several points that should be given careful consideration in the adoption of such a program.

1—Persons selected by your company for this work should not be in any sense classified or referred to as an electric truck salesman. His attitude must in all instances be non-partisan, remembering that every electric truck, battery and accessory in general manufacture is a good one—they all save money.

2—The collection and compilation of data regarding the comparative cost of operation of horse drawn, gasoline and electric trucks will be especially beneficial to your business community. This presupposes, of course, that the person delegated for this work will spend sufficient time to acquaint himself with the subject of commercial haulage and delivery work, with special reference to the application of electric trucks. It is highly essential that he learn the methods used by electric truck salesmen in overcoming gasoline truck and horse-drawn competition on what are obviously electric truck routes.

3—A complete file of the names of all electric truck owners in your territory should be maintained, together with a list of prospective purchasers and users of trucks of any sort. The list of trucks registered may be obtained from the Secretary of State from which list may be selected and listed on cards the electric vehicle owners.

4—A standing invitation should be extended at all times for local business firms in your community to consult or use the service of this bureau to find out in a nonpartisan way the relative merits of different types of delivery equipment.

5—The person selected should work in close harmony with any electric transportation association which may be in existence in your community or should work toward the establishment of such an association in order to bring the distributors and users of electric trucks, tractors and batteries into closer cooperation.

The Transportation Bureau has arranged to hold an electric vehicle school in San Francisco, June 8-13, which is the week just preceding the National Electric Light Association convention. You have already been advised of this school and asked to send one or more representatives from your sales and transportation departments. If you have not already given this matter your attention, registration should be made immediately through the chairman of the bureau. The bureau, as always, stands ready to assist in any matters pertaining to the use of transportation units.

Yours very truly,
Chairman Transportation Bureau
Pacific Coast Electrical Association.

First Aid Training

By CHAS. E. MORDOFF, M.D.*

ACCIDENT and fatality rates in industry in the United States are the highest in the world, and we all believe and in some places it has been proved that these rates are far higher than they need be. When we read that large industries have records of three months, six months, a year, and in one large company four years, with no lost time accidents we must believe that these records can be reproduced in our own industry.

It is probably conservative to state that 90 per cent of all accidents are preventable; that they are the result of thoughtlessness or of some state of mind which attracts the attention away from the job in hand.

The old method of accident prevention by using a list of "don'ts" has never been a success and has, of necessity, been replaced by more modern usages. There are many ways by which accident prevention propaganda can be put over, but whatever method is employed, success in reaching a goal must depend upon safe construction and maintenance of equipment, safe working methods, convincing the workmen of the value of foresight, good coaching and team work.

Of these, team work is certainly not the least in importance and, to my mind, there is no better way by which team work may be obtained than through instruction in first aid methods and by the development of first aid teams. First aid training, not of a selected few but of every individual in the force, cannot help but increase the efficiency of the force. Competitive first aid teams increase interest in this training and develop a team work which inevitably tends toward a higher morale. The spirit of competition rules here as it does elsewhere, in college for instance, and a department or district will take an interest in and encourage its first aid team against those from other departments or districts.

The matter of when instruction may be given, whether on company time or on the employee's time, depends to a large extent on individual company conditions. Who shall train the first aid classes among employees of an industrial plant? In many large industries and in many large cities, instructors accredited by the American Red Cross or by the U. S. Bureau of Mines are holding classes for the first aid training of industrial workers. In a majority of cases these instructors are the company physicians and their assistants who are qualified to instruct in the use of the triangular bandage. This type of bandage is the standard of the Bureau of Mines, and is used by teams in competitive work.

In teaching industrial first aid it is important that a minimum standard of instruction be adopted and that the training be general and not confined to the treatment of the types of accidents which are most likely to occur in a particular industry.

Any plan for first aid training should be built about four cardinal points, viz:

1. Shock—its symptoms and treatment.
2. Hemorrhage—how to control by direct pressure, seldom by tourniquet.
3. Asphyxia—its causes, symptoms and treatment; artificial respiration by the Schaefer prone pressure method; and the Sylvester method.
4. Transportation—careful handling of the injured in a minimum of time, so as not to cause pain or further trauma.

* Report of Accident Prevention Bureau, Technical Section.

First aid is not intended to take the place of medical service but serves rather to fill in the gap between the accident and the arrival of the physician. This is the period when minutes may mean the difference between life and death and when skillful treatment by a trained layman may save a life. The trained man knows what to do and he does it while his fellow workers are debating what should be done and suggesting all manner of crude remedies.

While the teaching of first aid methods to be of the utmost value should include training under the four heads outlined above, the first essential is simplicity The use of complicated anatomical charts and preponderant medical terms is often puzzling to the majority of the class being trained. It is far better to teach by demonstrations and actual practice by the class and to minimize the amount of lecturing used. To know what to do in an emergency is really the important thing. The man who can put his thumb on an artery spurting blood and hold it there until someone else can summon a physician will often save a life.

Almost of equal importance is the knowledge of what not to do. For instance, an onlooker thinking to be of assistance to a man who may have fallen from a scaffold runs to him and hoists him to his feet, thereby converting a simple fracture into a compound one.

By far the most important first aid work in the electrical industry, both in construction, generating and transmitting, is resuscitation from shock. The Accident Prevention Committee of the National Electric Light Association has adopted the standard method of artificial respiration known as the Schaefer or prone pressure method. There can be no argument against this selection, when performed according to the technique which has been worked out by the U. S. Bureau of Mines in cooperation with the American Red Cross. This method has also been indorsed by the United States Public Health Service and the National Safety Council.

While first aid is really separate and distinct from accident prevention, it has unquestionable value as an adjunct thereto, and should be included as an intimate part of every accident prevention program.

In order to determine what is being done by the Coast companies in the way of first aid training of their employees, the following companies were sent questionnaires:

Great Western Power Company.
Southern California Edison Company.
San Diego Consolidated Gas & Electric Company.
Coast Counties Gas & Electric Company.
Bureau of Power and Light, Los Angeles.
Southern Sierras Power Company.
California Oregon Power Company.
Pacific Gas and Electric Company.

The replies indicate that the Pacific Gas and Electric Company is giving the most complete training in first aid of any of the member organizations. While the first aid training work of that company is temporarily discontinued, the first aid trainer has been retained and it is expected that the work will be continued again during 1925. All of the other companies have given some training in resuscitation but for the most part very little training in other lines of first aid. This work has been done very largely by demonstratioins and in company time.

The Pacific Gas and Electric Company and the San Joaquin Light & Power Corporation, the latter not so extensively as the former, have carried on general instruction in first aid training and the employees of these companies have received the course given by the U. S. Bureau of Mines. In these two companies the work was carried on within the organization by trained laymen, supplemented in the latter company by occasional lectures and demonstrations by the medical director.

In the Southern California Edison Company and the Bureau of Power and Light of Los Angeles, the training is given by the safety engineer. In the other organizations it has been given by operating superintendents and their assistants.

In most companies the training in resuscitation is compulsory because it is given in company time, but the men are not disciplined if they do not attend every lecture. In some companies the work has been done partially in company time and partially in the man's time, while in one company the Bureau of Mines course was given in company time and the follow-up course in the man's time.

The Pacific Gas and Electric Company is the only member organization on the Coast which has consistently held intra-company first aid contests, although no team from that organization competed in the 1924 State First Aid Meet. It is expected that this work will be continued in 1925 and a team entered in the contests of that year. The San Joaquin Light & Power Corporation entered a team in the state meet but has made no definite arrangement for intra-company contests, nor for prizes for such contests. None of the other member organizations have organized any first aid teams or contests although several have expressed a hope that their first aid training program would be such that first aid teams would be developed and trained during 1925.

In the San Joaquin Light & Power Corporation and its subsidiary companies, the Midland Counties Public Service Corporation, Fresno City Water Company and the Bakersfield and Kern Railway, first aid training is being given to every employee. An instructor, who is trained by the U. S. Bureau of Mines, is combining first aid instruction with accident prevention directly, in that he is making inspection under the Railroad Commission G.O. 64 which is, in every essential, a safety order.

This trainer reports directly to the general superintendent of operation, but also reports to the Central Accident Prevention Committee and is a member of that committee forming an essential point of human contact between it and the local committees.

The plan which is being followed is that this instructor will train two or three men in each district or department, giving them intensive instruction, with the view of making them instructors and with the expectation that they will give instruction to every employee within their district or department.

All of the companies believe that the first aid work does result in real preparedness for the emergency treatment of injuries, also, that its benefits do reach into the home, and that the knowledge of emergency treatment methods has prevented many serious consequences from simple injuries.

The consensus of opinion seems to be that the U. S. Bureau of Mines standard training methods are best and several of them have stated that they hope to be able to have a team entered from their company in the 1925 state meet.

There can be no effective argument against the first aid training idea. That it is a good thing is admitted by everyone and experience has taught that as a part of an accident prevention campaign first aid training is highly effective. It is my opinion that first aid training in general can best be given by a thoroughly trained layman, who is able to get the average employee's viewpoint, and that it should be compulsory for all employees and the work be given in company time.

First aid instruction, and particularly instruction in methods of resuscitation from shock, form an excellent medium for the enhancement of better public relations. This is especially true in rural districts and has been forcibly brought to mind during the past year by a number of electric shock accidents to rural consumers, the lives of some of whom might have been saved, had their neighbors known how to give artificial respiration.

The broadcasting of knowledge of first aid methods, by whatever means it may be done, is worth any effort which it may cost. It would be a wonderful thing if every person in the entire territory served by the member companies of this association could be instructed in methods of first aid to the injured or at least in artificial respiration and the control of hemorrhage. Good work along this line might be accomplished in all of the companies, by offering to instruct farm bureaus, Boy Scout troops, high school cadets and civic bodies.

Whether or not a first aid team is desirable is a matter for each individual organization to determine, but I believe there can be no question as to its value not only to the team which receives the intensive training necessary to prepare it for contest work, but also to the entire organization because of the interest which it stimulates among the employee personnel. In order to stimulate the interest of first aid teams, inter-department or inter-district contests seem to be desirable and prizes of some sort may be offered.

Experience has shown that the attitude of the foreman toward this work is very greatly reflected in the attitude of the men under him. It should be the first job of the first aid instructor to sell the foreman the idea of the value of first aid, and it should be the duty of the management to see that every foreman is not only a competent first aid man himself, but that he shall be interested in the teaching of first aid methods to his men.

If no trained layman is available for the teaching of first aid in any of the member organizations and it is possible to obtain the services of the U. S. Bureau of Mines, it is highly desirable that every employee receive at least that training, which requires five days, two hours per day. This course gives the ground work for complete first aid instruction which may then be followed by a lay instructor or by trained superintendents or their assistants.

The Pacific Gas and Electric Company approaches the ideal in first aid instruction by having a full time instructor whose business it is to continually visit the various districts and teach all employees in those districts.

Company Organizations for Accident Prevention

By E. J. KENDALL*

FOR the purpose of ascertaining how and to what extent various corporations endeavor to prevent accidents in connection with their work, a questionnaire was mailed to and replies have been received from, eight Pacific Coast electric light and power corporations. Very full and specific information has been furnished by some companies, while others have submitted a rather brief and quite general report.

It is felt that the following will, to some extent, give the desired information as to the above subject:

In one case, we find that the organization for accident prevention consists of a central accident prevention committee composed of a general inspector, as chairman, and members of the medical, operating, transportation, construction and personnel departments. This committee holds monthly meetings and considers reports received from their local committees. Strictly speaking, there is no safety department, although the general inspection department acts in that capacity.

One company has a general safety committee consisting of three division engineers and the secretary of the electrical engineer, who meet approximately once a month, or oftener if necessary.

In still another case is a body known as the central committee composed of four representatives from various departments, who are interested in matters pertaining to inspection. This committee also acts in an advisorial way. They have positive control over accident prevention and training activities, which work is directly handled, in a general way, by the traveling superintendent. Regular meetings are held at which reports of current accidents are reviewed and preventative measures formulated.

Another company has a general central safety committee composed of various officers of the corporation who have general charge and supervision of safety work over their division safety committees. They establish safeguard standards and promulgate safety rules, as well as passing on or controverting safety matters and consider the awarding of prizes to individuals and departments for the best suggestions and records made for safety, as well as selectiing and designating premium stations or districts. In two of the above mentioned companies the accident prevention work is carried on under the direction of the claims department.

The central and general safety committees of the various companies mentioned above are, in numerous instances, supplemented by local accident prevention committees located in each district, power house, garage or machine shop. Meetings are held at a date just prior to the meetings set for the central or general committees, to which the reports of the local committees are sent for consideration. There are also local safety committees composed of foremen only, who hold meetings in their respective divisions. In some of the larger corporations there is a division safety committee in each division. These committees consist of a superintendent, a foreman, and one workman serving for a period of three months each. As each member retires his place is filled by a new man elected by the remainder of the members of the committee or appointed by the division manager to serve for three months; thus one member of this committee retires each month. In the division committee just mentioned each member acts as chairman for the last month of his term, thus always making the chairman the oldest member; and as a badge of distinction, each member of the safety committee wears a safety button furnished by the company, which he passes on to his successor upon retirement.

The duties of the division safety committee are to make safety inspections in its respective division, recommending safeguards, rules for safety, and safe working methods. They also investigate serious accidents and render written reports on forms provided for that purpose to their central or general safety committee. Each division safety committee submits a report of the result of their monthly inspections to the secretary of the central, or general safety committee. These reports are carefully preserved and copies are sent to the heads of the operating departments, and when the safety engineer inspects each division, he checks the division safety committee's reports.

The central safety committee issues safety bulletins twice a month dealing with accidents which have occurred on the system, at the same time showing the conditions found at different points. These bulletins are sent out regularly to each station, substation, warehouse, office, etc., where they are posted in conspicuous places.

Many, if not all of the local safety committees act in an advisory capacity only, reporting either to a safety engineer, inspector, superintendent or general or central safety committee.

Few, if any of the corporations have a full time "Safety Officer," although the Bureau of Power and Light of Los Angeles has a general safety committee, which includes the safety engineer who sees that all of the proper methods for accident prevention are carried out, also that the first aid work and first aid training are duly executed.

Another standing safety committee is composed of five types of employees, selected for their intellignce. This committee comprises men of or below the rank of foreman, and it is their duty to inspect, constructively criticise and recommend remedial measures. On this committee there is an employment or first aid officer, who acts as secretary of the committee. He sends a copy of his reports to the general superintendent and to each department head and theirs is the responsibility for remedial action. The prestige of this committee is, naturally, maintained by the type of men chosen for such important work.

Another form of committee, not mentioned in the foregoing, is in the case of a corporation having no central or local committees, all accident matters being handled directly by the claims department, who receive three different reports, one being signed by the employee in charge of the work in connection with which the accident has happened; a report signed by the injured and also reports of the witnesses to the accident. These reports are made in triplicate and are distributed, through the claims department, to the general superintendent, division superintendent and paymaster. The latter uses his copy for checking payrolls in cases where men are transferred from the regular to a compensation payroll. A so-called committee in this company automatically forms as soon as an accident occurs, consisting of the general superintendent, claims agent, division superintendent and district foreman. If the accident is caused by some condition of hazard, such condition is certain to be definitely disclosed and remedied as a result of this method. The accident prevention and educational work is left in this corporation with the various operating superintendents or heads.

Regarding the attitude of workers and foremen towards the organizations for prevention of accidents, various results have been found and expressed by such opinions as "fair and improving," "generally good," "fair," "quite satisfactory," "very unfavorable," "interest manifested and great improvement shown in different classes of work" and "interested and friendly." It also appears that the interest shown and regard taken for accident prevention work is proportionate to a

* Report of Accident Prevention Bureau, Technical Section.

man's earning capacity and intellectual rating. The lower one gets in this scale of classification, the less the interest shown, generally speaking. It is found that the attitude of workers and foremen towards the organizations has been very good, and the cooperation of local committees in the districts with the central or general committee, has been quite satisfactory. Occasionally, however, some resentment is shown by the individual. Again it is found that large majorities of the employees and the foremen show a considerable degree of confidence in the method and results of accident prevention work. It is even said that this is true with foremen and workmen, who more readily accept these methods than do those men higher up, such as district managers, local superintendents and agents.

In connection with the method of operation and extent of accepted or acknowledged authority, it appears in one instance where the general manager has plainly indicated his own backing of his safety organization and its work. This known approval of the general manager has been reflected down the line by a respect for the same on the part of the department heads and foremen. Also, the work, after having been accomplished, has gained greater respect and standing among the men. In a few individual cases it was found necessary to get word direct from the general manager to an "unbeliever," but these have been very few and have had their effect. Persistency in this work is of the greatest value. Where periodical inspections are made of plants and equipment by capable employees, and due consideration of reports of such inspection by the proper committee is given and steps taken to remedy unsafe conditions, it is found that all of these things are considered by the employees, generally, as desirable and helpful to all concerned. It is also good practice, where equipment and personal property or tools of the employee are found to be unsafe, that said equipment or tools should be condemned and employees instructed to secure safer ones. In most instances where corrective measures are recommended after inspection by local safety committees, all action is left to the management.

In those instances where a safety engineer is employed, he is usually and almost without exception, considered and called into consultation with any group who are studying the questions where safety is considered and his experience and opinion are deferred to.

The effectiveness or practical results of these forms of organizations appear to be as follows:

Satisfactory results have been accomplished in a rather quiet, and it is believed, a more effective way than could be done by a safety supervisor or inspector making it his whole business, unless perhaps it were possible to find just exactly the right man, which is difficult. It must be admitted that the man whose knowledge of safety work and, at the same time, of the company's business in its various departments, with the right personality and peculiar characteristics essentially necessary, is hard to find.

It would seem very advisable that full authority be vested in the central or general committee and that the various department heads let it be well known that the general manager has given definite authority for carrying on of the accident prevention work of the committee. It has been found that when this has been properly done the men themselvs become quite interested in this work. Most of the replies to our questionnaire would indicate that the forms of organizations, as above outlined, are satisfactory, effective and produce at least good, practical results.

The extent and manner or method of the work of accident prevention is dependent, in great measure, upon the size and activity of the particular organization in question. This line of endeavor is different from general welfare or insurance work, and in order to secure the best results, should be handled by a man or a group of men thoroughly familiar with the equipment and operating practice of the company; by a man or men holding the confidence of the general body of employees and by those thoroughly enthusiastic in the work of accident prevention. Committee reports and reports of proceedings and findings should be given considerable publicity, and commendation should follow safe action and suggestions, as well as censure for carelessness or lack of thought or observation. It might be very advisable to make the minutes of the central or general committees available to the district or local committees for their general information.

It is suggested that complete records of all accidents should be kept. These records should be classified and subdivided to such an extent that a comparative compilation may be readily made and from which can be shown benefits resulting from accident prevention efforts. In this, and in no other way can those who are deeply interested in the subject of accident prevention show that their work has been worth while and that they have not only accomplished the much desired result of preventing accidents, but that they have, as well, effected a considerable monetary saving. Other methods suggested for stimulating interest and cooperation as mentioned in the various replies to our questionnaire are competition between crews, districts or departments, decisions being based on percentage, handicaps, etc., rather than upon actual records. Also, that after a satisfactory basis for competition could be decided upon, competition between companies might be a wonderful stimulant towards making a complete organization a central accident prevention committee.

Among the suggestions made of various methods used for stimulating the activity of individuals and committees, one company considers it advisable to make the accident prevention phase a part of the regular work of employees.

One of our correspondents very happily states that they did not find it necessary to stimulate safety activity for the reason that loyalty to the company and each other is very pronounced among the men of that company. Furthermore, it has been found that by giving all credit to the committees for suggestions and accomplishment of a reduction in accident frequency and severity, their activity will thereby be stimulated and kept alive. Also the giving to individuals and committees of some idea of the frequency and severity of accidents in their particular district as compared with some other district or districts has a tendency to cause a friendly rivalry between districts in making a showing of a "No Accident Record." It has also been found that where some problem exists good results follow by giving to the local committee or some member of such committee, the opportunity to suggest some remedy or to study and make a report on the existing condition, rather than to have an inspector embody the same in his report as against the local committee or member.

Finally, there appears to be little question that the effectiveness of accident prevention campaigns through various committees or other channels has been shown.

Apparently one of the best forms of organizations might be considered as that of a central accident prevention committee composed of representatives from various departments of the company, working closely with local committees. The central committee is more or less permanent in organization, while the local committee is usually composed of only a few members whose services as such end within a few months, leaving, however, one old member on the committee. This permits a considerable number of employees in each locality to come into close contact with accident prevention work.

The scope or limit of authority given to the general committee necessarily must not be too great because the ultimate decision in many things, especially where the expenditure of money or question of policy is involved, must rest with the management. It is well to make the scope of activity as great as the committee can make it without overstepping the bounds of pure accident prevention or health conservation.

Regarding the use of bulletins, one of our correspondents is of the opinion that bulletins have more of an interest to the average employee than written or printed advice, for the reason that pictures will better attract and hold his attention. If these bulletins can be made up covering recent local accidents and injuries, they will interest men even more than the stock safety bulletins, illustrating possible accidents. This same correspondent also believes that safety suggestion boxes are a good thing, and that from time to time good suggestions, which might well be adopted, could be had from such boxes. Safety films to be had both from the national safety council and from the State Industrial Accident Commission also have their proper place and effect.

Without doubt, much good can be accomplished through frequent personal contacts with local accident prevention committees by a member or members from the central accident prevention committee. The local committee's interest would most likely be much stimulated thereby. No such effort is ever wasted.

Safety Bulletins

By F. V. WRIGHT*

THE accident prevention work of practically all member companies includes, to some extent, the use of safety bulletins. For purpose of consideration the extent of use will be divided and discussed as follows:

Intensive

Seven of the nine companies reporting use the bulletin service of the National Safety Council for their primary requirements. Bulletins which carry a pertinent message of caution or safe practice are selected and posted on bulletin boards (either special or general) located in positions most convenient for observation by employees entering or leaving work. A few of the companies supplement the National Safety Council bulletins by some which they prepare themselves or obtain from insurance companies.

Casual

The Pacific Gas and Electric Company uses only bulletins prepared in its own organization. A new bulletin is published twice a month usually depicting one of its own accidents or showing accident statistics.

The California Oregon Power Company has permanently posted its system with the N.E.L.A. bulletin on the Schaefer method of resuscitation but makes only occasional use of other bulletins.

The methods of circulating and posting are varied. All agree that bulletin boards should be provided in prominent locations and be protected from the weather. Quite elaborate boards are provided by some companies. The opinion is general that only one bulletin, or at most not to exceed three or four, should be posted at a time and these changed frequently, whether on a special or general bulletin board.

The apparent effectiveness as well as the attitude of the employee depends upon the attitude of the company and the accident prevention committee. When intensive use is made and posting and circulating closely supervised, the apparent value is reported as highly satisfactory. When the safety supervisors are careless in selecting and posting and consider the bulletins of little value the attitude of the employee reflects this condition.

Suggestions

It has been demonstrated generally that bulletins properly selected with subjects covering the everyday hazards, careless practices and simple safeguards with very little printed matter, are a very important part of an accident prevention program.

To secure proper consideration by the employee, bulletins should be treated with respect by the safety engineer, foreman, superintendent and committeemen, kept in good condition until posted and posted in such location as to secure the voluntary attention of the employees and protected against mutilation. In other words, the safety engineer, committeemen, foremen and superintendents must be sold on the value of the safety bulletin before we can expect serious consideration by the employee.

A uniform procedure for the use of safety bulletins cannot be recommended for all companies in the absence of more or less uniform methods along all lines of accident prevention work. Special conditions and emergencies must be met from time to time with special treatment. Bulletins, to a certain extent, follow the accident prevention program and the adoption of standard methods would to some extent restrict the individual initiative.

The exchange by member companies, through this committee, of plans and special bulletins which have proved of more than usual value should be continued on an extended scale during the next year to secure the greatest value in educational work of accident prevention.

* Report of Accident Prevention Bureau, Technical Section.

Code of Safety Rules and Safe Practices

By V. R. HUGHES*

THERE seems to be about equally divided opinion as to whether all of the rules should be in one book or if each division of the work should be covered by an individual pamphlet.

Some contend that all employees should know all of the rules, those that govern the other fellow as well as those governing himself, so that in case of transfer, he would know what was required, as also he would be better able to cooperate with his fellow-workers.

Others think that to incorporate all the rules in one book would make it too bulky, as well as unnecessarily expensive; that it would not be read and memorized, especially by the linemen.

Others contend that there should be separate books for each field of endeavor, since the more complicated the rules are, the less practical they will prove to be; and to be of value they should apply definitely to particular work. All divisions of work might therefore be covered under distinct headings in one pamphlet, although a lineman will not read through the rules of other departments to locate those applying directly to his work.

Perhaps the better way would be to have separate pamphlets for each division, one for chief engineers, division engineers and district foremen of all departments; one for the electric distribution department, for the district foremen, foremen and workmen; one for transmission and substation division, for the division foremen, foremen or chief operators, operators and workmen; one for the generating stations, for the chief operators, chief engineers, foremen, operators and workmen; one containing special rules for safety organizations, resuscitation and first aid, to go with any one or more of the above.

Undoubtedly one book should include rules both for the foreman and the workman, because the workman can then know the foreman's rules as well as his own and can check him on safety; and when some day he is foreman, he will know what is expected of him for the protection of all.

It seems to be general opinion that a few fundamental explicit rules that can be enforced are better than rules to cover every operation, which would destroy initiative in the workmen.

Some contend that all rules should be iron-clad while others say there should be iron-clad rules for certain operations, other operations being covered by safe practices. Where there are a few fundamental safety rules or laws, there should be a standardized operating code book for details of the work. As near as can be determined before actually writing the rules, ten to fifteen should be enough to cover safety laws in each department.

Opinion is equally divided about the advisability of including disciplinary penalties in the standard code, although the consensus of opinion is that rules should be enforced in order to be valued, and some consider that disobedience, neglect or rule-breaking are sufficient grounds for penalty to be determined in each such case.

It is generally conceded that a rule book is not enough for a lineman, especially as many are inexperienced. Some think the foreman should be instructed, he to instruct the linemen; others think that instruction in class with an occasional examination should supplement the rule book; and still others consider reviews or instruction at assembly points or in camp to be more advisable, as classes are often a bore.

General opinion seems to be that first aid instruction should be included in the book and some think that fundamental hygiene should probably be included as well.

It is agreed that the book should be about 4 x 6 in., so that it can be carried in the pocket, of a loose leaf type to permit addition or replacement.

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Accident Prevention Course for Linemen

By F. A. BROWN*

SOME of the Pacific Coast companies are distributing copies of the N.E.L.A. course for linemen. None are conducting a course as such. The Pacific Gas and Electric Company and the San Joaquin Light & Power Corporation at the present time have line instructors who were for a number of years engaged in line work. These line crew instructors spend the necessary time with each crew to see the performance of all

* Report of Accident Prevention Bureau, Technical Section.

classes of work. If any unsafe methods or practices are in use they are called to the man's attention and required to be discontinued and safer and better methods are recommended.

After watching the conduct on different classes of work, if careless or incompetent men are found they are cautioned and the attention of the foreman and superintendent called.

The line instructor sees that the necessary safety devices are carried with each crew and where others are needed he recommends them to the proper authority. In addition, th Pacific Gas and Electric Company's instructor on the last day of the visit with each crew recites the fatal and serious accidents of the past few months, explaining the causes and prevention.

The San Joaquin instructor is primarily engaged on maintaining construction standards. The apprentices are stepped up to linemen's rating at the end of a specified period of time, provided they can do the work of a lineman, but without an examination as to their proficiency or their knowledge of safe practices and the company's rules and regulations, except as they have demonstrated such knowledge in their daily work to the satisfaction of the foreman under whom they are working. Other companies have the same promotion arrangement for linemen.

The consensus of opinion is that the success of an educational course would depend somewhat upon the manner in which the course was given. If the men were required to take such a course upon their own time, very little interest would be taken, especially by the older men, and one construction superintendent writes that he does not consider such course practical to conduct in that manner.

The printed course provided by the N.E.L.A., placed in the hands of the linemen, however, is considered and proved of value and further interest would be stimulated if promotion depended upon proficiency in this course.

The opinion of the majority is that we might find some of the foremen taking exception to having their old methods questioned or perhaps condemned, and this condition would, of course, have to be corrected by first educating the foreman.

Suggestions

One of the causes of accidents is lack of knowledge. The need for training linemen in safe practices is unquestioned. Such education in any line of work has a telling effect in the prevention of accidents and by increasing efficiency because in addition to educating the man we teach him to think. The scope of such a course should cover the various safe practices.

Tests may be practical, by observation of a man's daily work and if desired, supplemented by oral or written examination.

It is suggested that there should be placed in the hands of every lineman a copy of "Accident Prevention Course for Linemen," prepared by the Accident Prevention Committee, National Electric Light Association, 1924.

After the men have had opportunity to study it, a section or two of this course could well be reviewed and discussed at the various forms of employee gatherings, such as when the instructor brings the linemen together at the close of his visit in a district, or at the club or social gatherings when refreshments and perhaps entertainment may be provided and employees' families invited.

At these times the apparent proficiency of the men should be noted by observers and recognized according to merit.

Safe Practices

By W. L. SMITH*

IN order that the extent of improvement of safe methods used in the construction and operating field of the public utility and also that the development of safe practices might be determined, an inquiry covering certain well recognized safe practices, as well as some less known, was sent to the members of the committee representing various utilities on the Pacific Coast. Every one responded and their comments are reflected in a discussion of the following questions:

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General Practice of Placing Electrical Equipment in Service

This was discussed from two angles, the first being that recognized necessary tests and inspections be made by those responsible for the construction and installation of the equipment in question. Second and perhaps most important from the standpoint of safety is that of transferring the equipment from the construction to that of the operating department's hands. One company states that the construction engineer serves notice to the operating engineer that equipment, where same is required and is available, will be completed at a date specified in such written notice.

Upon such notification being given to the operating engineer, all such equipment as high voltage lines, feeders and branch primaries, arc-circuits, station or other equipment as the case may be, on and after the date specified in the written notice, shall be considered live and in regular service. It must be presumed by all concerned that the equipment is in operation and therefore no work shall be done upon it by anyone in the construction department or under the supervision of the operating department without first obtaining authority and clearance from the operating department in the regular manner. It is important, therefore, that construction engineers make sure that all employees under their supervision understand this working arrangement prior to the date specified in the notice to the operating engineer that such lines or equipment will be placed in operation on the date specified.

In the event that the lines or equipment are needed in an emergency and are placed in service prior to the date specified in the notification, sufficient counter written notification must be made and all employees concerned thoroughly informed of the new working arrangement.

The importance of the operating department being fully informed regarding condition of work done on any portion of the high tension system is also manifest.

Safe Method of Handling Clearances

(1) All companies have a standard practice for the issuance of all clearances by the operating department, to be centralized in load dispatcher's office.

(2) Clearances must be given only to authorized parties.

(3) Sufficient notice to dispatcher is required, in most companies; either one day's notice or special permission from the operating engineer's office is required before a clearance is granted.

(4) Party requesting clearance should make an indedendent check of disconnection of such lines or equipment and also is required to wait for the personal and definite statement that he has a clearance before beginning work on same.

(5) All statements in connection with clearance shall be repeated to eliminate any misunderstanding, clearance not to be given if telephone communication is not thoroughly clear.

(6) Load dispatcher and station operator log all details of clearances, some companies also require patrolmen and others to keep memoranda concerning their part of the clearance.

(7) In no case will any additional party work under a clearance unless they are working directly under the supervision of the first party who has taken out the clearance, this applies either to line or station equipment.

A patrolman or substation operator usually acts as representative from the dispatcher's office, giving the clearance to the party in the field or substation who is authorized to do such work. The substation operator instructs the second party to place his own short and ground before starting the work and must keep the dispatcher's office informed as to the nature and progress of work accomplished and detail any changes made under his clearance, also to arrange with dispatcher for the transfer of clearance to next man coming on shift if it is not completed during his particular shift.

The patrolman in delivering a clearance to a second party places a short and ground on the line in sight of the second party, the same patrolman is responsible for turning in clearance to the dispatcher's office after removing the short and ground.

It is usual procedure in all companies to sectionalize lines or equipment, and in the case of lines, to short and ground at both ends as well as the point where work is being done. (This rule is intended to protect against a cross which might occur from a failure on lines of other utilities as well as the company concerned.) The most approved type of procedure for shorting and grounding lines is as follows: The ground wire or chain is first made secure to a good ground through an approved clamp, the other end of the line is fastened to a cotton sash cord. This cord is thrown across the line first, the patrolman or workman pulls the ground wire or chain (using rubber gloves) across the circuit he is attempting to ground, thus shorting as well as grounding it. The pulling of the ground wire or chain taut completes the operation in the case of the line grounding. A more solid ground, however, is made in the case of equipment and buses in stations, a clamp being fastened to ground first and then to the bus or equipment.

(8) In practically all companies maintenance crews working under the supervision of the operating department and making periodical inspection of equipment must follow the same procedure as other workmen in obtaining clearance from the dispatcher.

(9) Tags or black, wooden blocks with the words (printed in red), "Men at Work" or "Men on Line" cover controls of all switching gear while clearance is in effect.

(10) Finally, the success or failure in carrying out the procedure of clearances depends upon the

Views showing the method of lowering an unconscious man from the top of a pole, using the scheme devised by the fire departments of some of the large cities

close cooperation between the parties handling the work on the clearance and the load dispatcher. This necessitates that all employees concerned should be thoroughly coached and made to realize that every possible safeguarding is in the interest of their personal safety.

Safe Method of Operating the Two-Circuit Peddler Line System

This is particularly a system where large industrial consumers are supplied with two high-voltage lines, say anywhere from 10,000 to 35,000 volts. The consumer may run on either line and do their own switching to the other line in case of interruption to service.

Reports from three companies state they have no circuits of this character, three other companies state that in connection with this type of circuit the dispatcher does the ordering of patrolmen, troublemen or operators in connection with switching or clearances in the particular industrial substations. Clearances are handled in same manner as on single-circuit lines with the addition of a special caution to workmen to the effect that the second circuit is or is not energized.

One representative reports that inasmuch as consumers cannot be depended upon to report any switching, they are not requested to make any report of it. Therefore after any interruption, it is absolutely necessary to make a check of all these consumers before doing any line switching. Switching of these consumers' substation by the consumer does not parallel the lines, due to the switches being mechanically interlocked. Patrolmen or troublemen may, by unlocking this interlock, parallel the lines and thus change a consumer from one line to the other without an interruption to the consumer. Patrolmen or troublemen must replace and lock the interlock mechanism. The dispatcher must check the locking of this device and make an entry in his log to show it. Any such switching by the patrolmen or troublemen must be done only on direct orders from the load dispatcher or his representatives in the outside districts.

Linemen must not work on any section of line involved in these double circuit consumers' substations until all pole tops (or disconnect switches) on that section of line at such consumers' substation have been opened.

Consumers have keys to their substation building or enclosure, but do not, and should never have keys to either pole top switches or oil switch interlocks.

Safe Method of Lowering Injured Person from Top of a Pole or Other High Place

Replies from all companies seem to demonstrate the fact that there is no recognized standard method in overhead line practice covering this operation.

It is realized that conditions may vary considerably in the position of an injured man on a pole and a standard method may not apply. Linemen, however, are usually resourceful in handling a rope in this case; they may be a little rough with the victim but they get the victim down before it is too late to apply first aid or artificial respiration.

One company states that the rope is placed around the victim's arms then through the D ring of the safety belt, if a belt is being used. If victim has no belt on, the rope is placed around the victim's waist then around the body under the arms. This will take the pull of the rope from under the arms as one is being lowered.

Another explains a method of using two half hitches—one below the hips, one under the arms—to make a sling. This method is crude but effective. A variation from this is to use the belt and in addition use a bowline hitch around the arms and body to keep the victim from falling through his belt, in all cases the working end of rope is passed over the nearest adjacent crossarm to lower the victim.

One company investigating the simplest and quickest means for lowering the victim adopted the method as used by the fire departments of several large cities as the easiest to apply and one in which the victim is less likely to be further injured. Special mention is made of Captain Samuel H. Calderwood, of the Los Angeles department, who originated the method. The following is offered as a suggestion:

Using a ¾-in. manila rope which is usually available, make a double bowline on a bight, bringing the loops up around each leg to the thigh, then bring the working end of the rope up, making two half hitches under the arms and chest, locking these two half hitches by another half hitch so that the rope cannot slip either way. By this method the body is supported mainly at the hips and the rope cannot bind or cut the body.

This suggested method is demonstrated in the accompanying pictures. The top center picture illustrates a method particularly applied to lowering a woman from a burning building. In this case the rope is applied around the ankles instead of at the ribs.

Safeguarding Against Explosion and Asphyxiation in Manholes and Tunnels

The following reports regarding practice of above subject were received from various companies:

The California Oregon Power Company—Have no manholes.

San Diego Consolidated Gas & Electric Company—Gas masks provided, kept clean, sterilized and always ready for service. H. H. inhalator used supplementary to artificial respiration in case of asphyxiation.

The Southern Sierras Power Company—No provisions needed in its operations.

Pacific Gas and Electric Company—Have gas masks in each division cared for by gas department but often loaned to electric department to disconnect burning apparatus.

Great Western Power Company—Use and maintain gas masks for operating in manholes.

Southern California Edison Company—Use suction fan and after it has run for short time a piece of lighted waste is dropped in the manhole. This is called shooting the hole. It has been proved that pump will clear all gas if left running long enough.

San Joaquin Light & Power Corporation—Did not answer.

Los Angeles Bureau of Power and Light—Provides proper ventilation on new construction work. In testing for artificial or illuminating gas that might have leaked into manhole, the Kohler miners' safety lamp has been found very satisfactory for determining approximate percentages of gas or if air in manholes has a deficiency of oxygen. Sufficient gas masks are provided and maintained for the use of the men working in manholes.

Conclusion

Heretofore the subject of safe practices has been discussed briefly and there seems to be a common agreement that the matter of safe practices should be incorporated into the standard safety code and especially in an accident prevention course. It is only by the widest dissemination of this knowledge that the greatest good can be achieved in the elimination of accidents and fatalities.

Safe Tools and Devices

S. M. Bullis*

ONE of the best arguments for accident prevention is that is does not entail loss of efficiency nor impairment of service. Each time a safer tool is developed a more efficient practice is effected, and a man working safely with a safe tool is more efficient and loyal than one with poor tools. The support of those in charge of operation and maintenance is secured only when it is proved to them that safe work is as rapid and efficient as unsafe work. Introduction of tools permitting efficient accomplishment of necessary maintenance and operation, at the same time minimizing personal risk to the operator, offers that proof.

At the time when uninterrupted service was not imperative, maintenance work could be accomplished with the tools ordinarily used for construction by killing the line. Today many processes and industries require as continuous a service as it is possible to render. This, together with the growth of industry, has demanded heavier construction and intricate connections.

The lineman still cling to their traditional desire to be "juice eaters," but it is difficult to go before a jury and blame the injured man when the first inquiry might be "Were proper tools and protection supplied?"

Tools for handling hot lines amply justify themselves from an efficiency standpoint, by reducing the lost time of switching, which often was greater than that required to do the job. It has been demonstrated that a picked crew of good linemen will actually do the job itself quicker, and they like their work better, and without taking any chances at all they get a greater "kick" out of their work than they did even in the old times when linemen handled 2,300 volts almost bare handed.

The demoralizing effect of an injury to one of a crew, the difficulty of satisfying the workmen that a

*Report of Accident Prevention Bureau, Technical Section.

line or equipment is adequately killed and grounded for his protection, and that it will remain so; the loss of time due to switching, even greater than time lost due to preparation for hot line work, and, beyond all else, the fact that the crew is being trained in safe practices; these are all distinctly advantageous.

This report presents several devices developed on systems of member companies primarily to facilitate work at once described as both efficient and safe.

Most companies use standard equipment, and most of them, in addition, have developed devices for one thing or another. Some of the prominent but least known, perhaps, are set forth as follows, for the benefit of those companies not yet using them.

Dead-end Board or Portable Staging

Two companies offered photographs or prints of portable stages for linemen making dead-ends and for similar work. Fig. 1 shows a patented type used by the Bureau of Power and Light, and Fig. 2 shows one developed by the Pacific Gas and Electric Company.

Still another company uses a board hung with ropes when making up dead-ends with long strings of insulators, or when using long arms on transmission work, when without these devices the linemen are subjected to physical strains due to the positions in which they must otherwise place themselves.

Pole Platform

This is similar to the above except that it is larger and is hung in the front of a pole for more extensive work such as transformer maintenance. (Fig. 3)

[Note: Linemen must be particularly cautioned not to work from any of the above boards or stagings without proper attachment of safety belts, which, as a rule, must be provided longer than ordinary.]

Tester for Street Lighting Circuits

The San Diego Consolidated Gas & Electric Company has an arrangement which the men call a "pea shooter" with which they make a check test on a street or lighting circuit when the ordinary test with magneto is not satisfactory to determine that the circuit is closed. (Fig. 4)

This device employs three dry cells connected to a Ford spark coil enclosed in a box, having on the outside of it a snap switch in a battery circuit, and on top, a spark gap in the secondary or high tension circuit, this gap set to 1/8 to 1/16 in.

Cords with ordinary test clips are provided from the high tension terminals of the coil, the spark gap being in series in one of these terminals.

A man working on the line when a test is made will not be harmed. The use of the set is considered safe and is said to give sure indication and saves unnecessary patroling lines many times.

Wooden Pliers

The San Diego Consolidated Gas & Electric Company developed wooden fuse pliers, which perhaps are more or less known in some form. (Fig. 5.)

Fuse Stick

The California Oregon Power Company provides a device (Fig. 6), which permits of gripping a piece of broken fuse as well as normal fuse handling. The fuse is held in the rubber lined slot by the slide operated from the handle.

"Jackson High Line Hook" for Attaching Hot Taps

The San Diego Consolidated Gas & Electric Company furnished the drawing (Fig. 7) of a device for attaching tap clamps to hot lines.

"Hickey Stick"

The Great Western Power Company has developed a hand tool used in the underground work generally in connection with fuse pliers for changing junction box

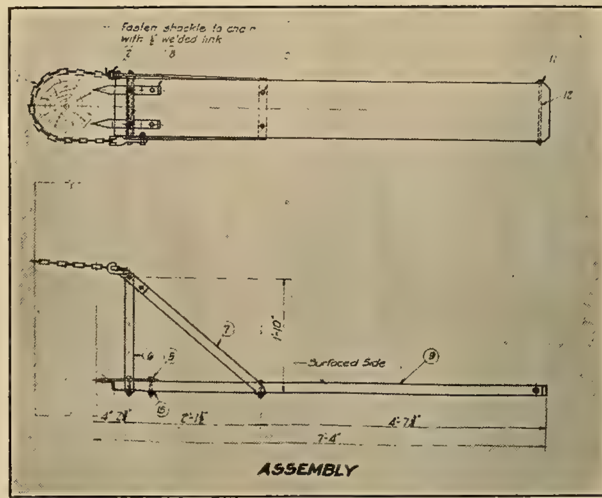


Fig. 2

fuses (Fig. 8). The "Hickey Stick" acts as a socket wrench having a slot to receive the wing nut and springs to hold the swing in the slot so as to avoid dropping the nut. The wooden handle is paraffin soaked.

Grounding Clamp

The Great Western Power Company has also perfected a clamp used for grounding high voltage line conductors. It is built not only to clamp on but to screw up tight to eliminate possibility of becoming unfastened. (Fig. 9.)

"Hot Wire Tester"

The Great Western Power Company also sent a sketch (Fig. 10) of a pencil-like, hard rubber device employing the familiar spark plug testing tube, which glows when placed near a live conductor. We presume that these are not suggested for "testing," high voltage conductors, unless fitted to a suitably insulated handle.

Wrench for Acetylene Tanks

The Bureau of Power and Light recommends a socket type of wrench with straight stem approximately 4 in. long, and with a wheel handle on the end opposite the socket. A raw-hide leather string ties the wrench to the

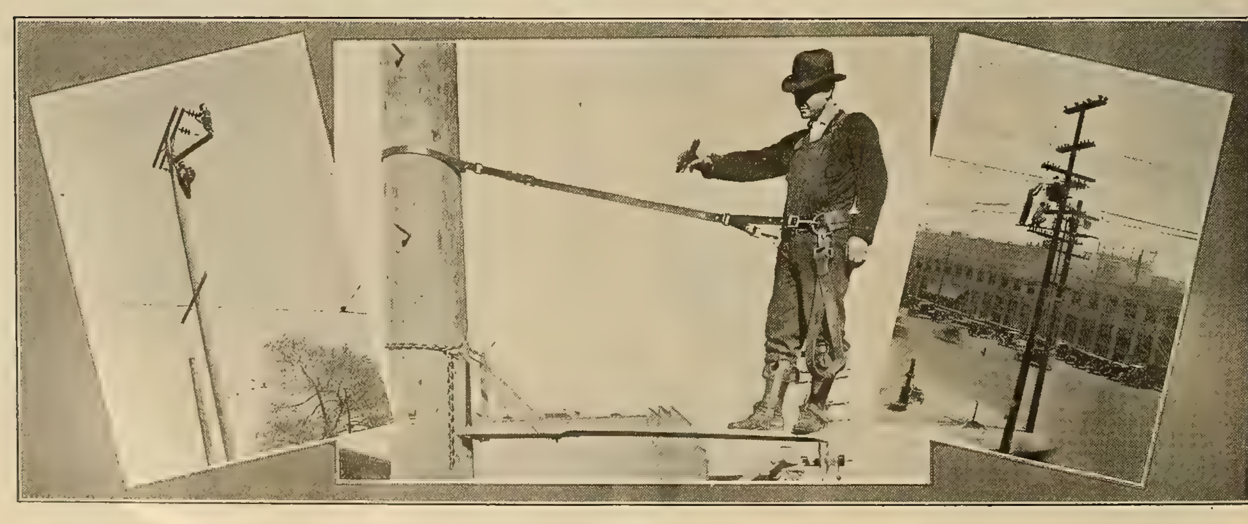


Fig. 1

acetylene tank, and is an improvement over the ordinary wrench particularly in that it permits closing the valve should the gas hose become broken at its junction with the tank stand and the gas be ignited, in which case it is practically impossible to get the hand close enough to use the ordinary wrench.

Ladders

For electric stations the Great Western Power Company recommends the exclusive use of ladders made of kiln-dried lumber, covered with standard insulating varnish and equipped with non-skid tips. Incidentally

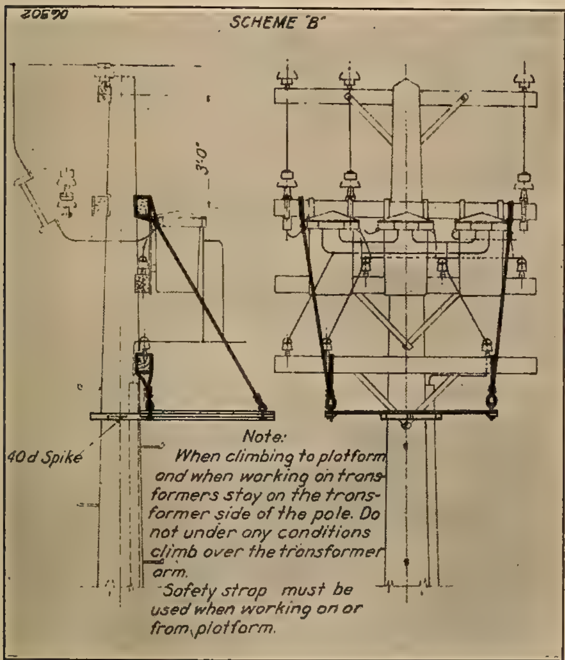


Fig. 3

load bindings are cut. Two ¼-in. ropes of about 115 the proper placing of the ladder and prevention of slippage, are matters warranting considerable education.

Method of Unloading Poles

The Southern California Edison Company employs a method of unloading poles from cars, described briefly as follows:

Special car stakes are placed on the back side of the load, and these stakes are braced to the ground. These are used to support the back side of the loads when the ft. each are made fast at one end to a stake socket on the unloading side of the car, one near each end. These ropes are thrown over the top of the load and a turn taken around the hub or journal box of the car trucks. The unloading skids are then put in place as usual. Next the binding wires and stakes on the unloading side of the car, may be cut safely, the two ropes holding the load back against the braced stakes on the back side of the car. The men on the back side of the car then pay out the ropes, allowing the load to easily settle down on the unloading side.

Device for Grounding Line Wires Being Strung or Removed

The Southern California Edison Company has devised a channel iron plate, fitted with two guide rollers to be clamped to the cross-arm when men are stringing in or taking down a line, either under or over a hot line.

One of these devices is provided for each wire being strung or removed. They are bonded together and grounded, the whole set being used on the first pole away from the reel. Another set is used further along the line, particularly where a good ground was not obtainable at the first pole.

Safety Flag Stand

Because of a number of accidents caused by people driving into guy wires, lead lines, line wire, etc., when down, because often times the flag used for signal was not clearly seen, or had fallen over, the Edison Company has developed a folding flag stand.

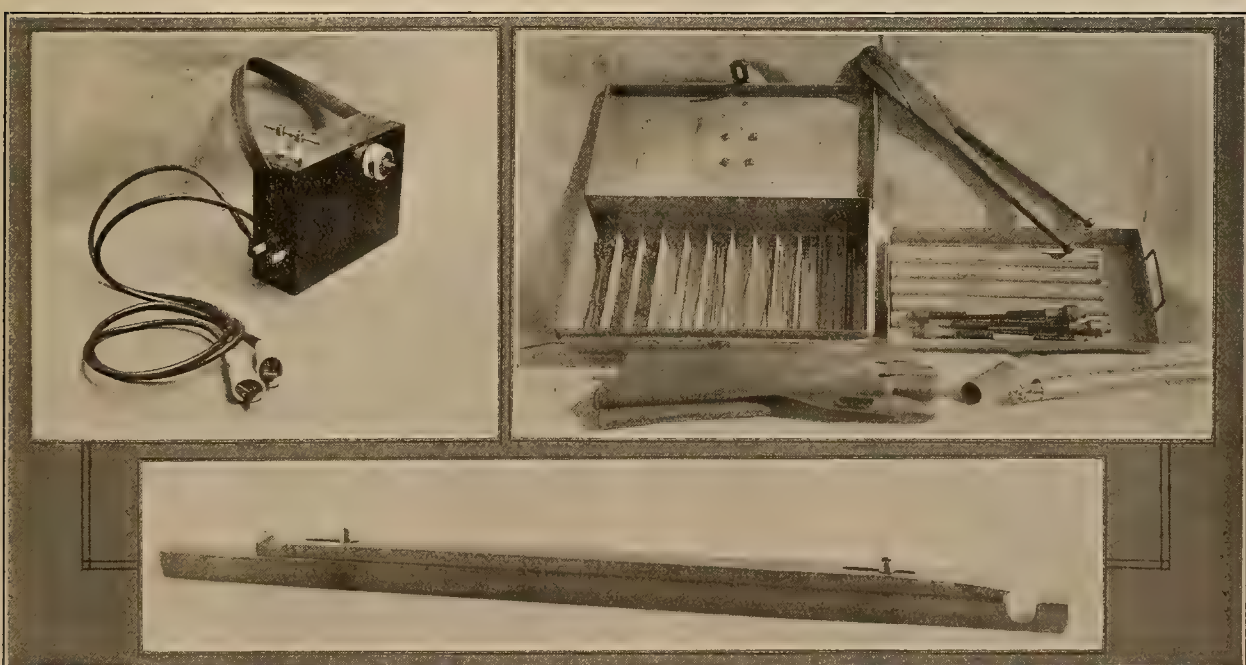
It is made of ½-in. pipe with an 8-in. diameter maleable iron base, having a cross member from which the flag is hung vertically when in service showing the full size of the flag about 2½ ft. above the road. The cross member folds against the stand.

"Hot Tapper"

The Southern California Edison Company has also devised some "hot taps" which are used in bush fuse pullers for making taps to hot 10 or 15 kv. lines, doing away with other forms of tap sticks and reducing the number of tools required to be carried.

The Edison company's transportation department is developing a portable rig which can be placed on the rear end of a 3-ton Mack truck and used for setting poles, the work of raising the pole being all done by a drum and cable operated by the motor through a clutch.

This company also states that pike poles are all 16 and 18 ft. and before being accepted each one is tested by supporting the two ends and hanging a 200-lb.



Figs. 4 (upper left), 5 (upper right) and 6 (bottom)

weight in the center, and revolving the pole, thus testing the pike on all sides.

They are treated with two coats of hot linseed oil as are the handles of all tools needing similar preservation to keep them from getting rough and splintery.

Hot Wire Tools for 10 to 15-kv. Line Work

In order to safely do maintenance work and also tie in new lines etc., without interrupting service, the San Joaquin Light & Power Corporation has developed several very unique and satisfactory devices as well as method or routine of performance.

There are, altogether, twelve different devices for the various operations involved in changing dead-end insulators as well as pin-type insulators, cutting in jumpers and replacing them, not by hot-tap clamps but in a permanent fashion. These are also used for transferring hot lines to new poles and in cutting in new extensions.

In all cases the tie wires, jumpers, etc., are actually served onto the line wire as though by hand.

The tools consist of a tie-stick, wire-clamp, pigtail hook-stick and crossarm clamps for pin-type insulator work and jumper work. For dead-end changes a hot-wire "come-a-long," a tool to apply it to and remove it from the hot line, a crossarm sling, a set of blocks with attachment for applying them to the hot wire "come-a-long" and an "alligator-stick" for handling the insulators and tools are used in conjunction with the above tie-stick and pigtail stick. In addition a special hot-wire cutter is employed.

The tools that are used in contact with the hot wires are equipped with treated wood handles 6 ft. long. This wood is tested to 20 kv. per 6 in. of length. The operator never needs to get closer than 3 ft. to the hot wire.

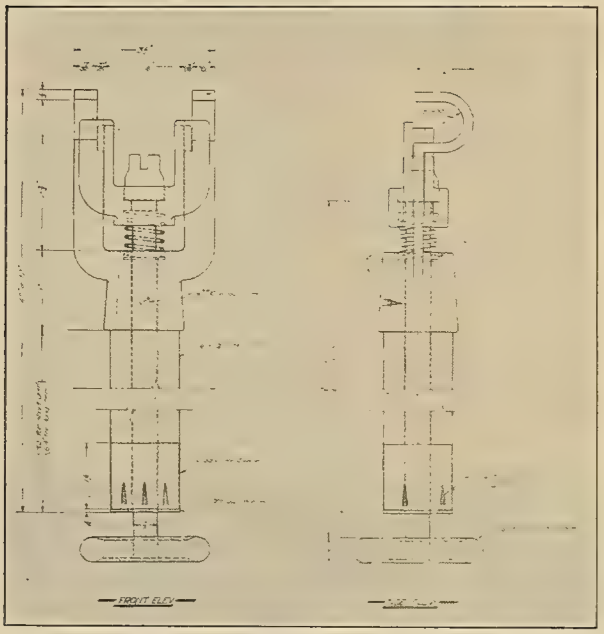


Fig. 7

The tools have been in use on the San Joaquin system over a year and there has not been a single accident to any man using them.

Patent is pending on these tools and they will probably be available in a short while. They have proved themselves on the San Joaquin system and have resulted in a large saving in expense of maintenance of distribution lines and a larger saving in interruption to service that they have obviated.

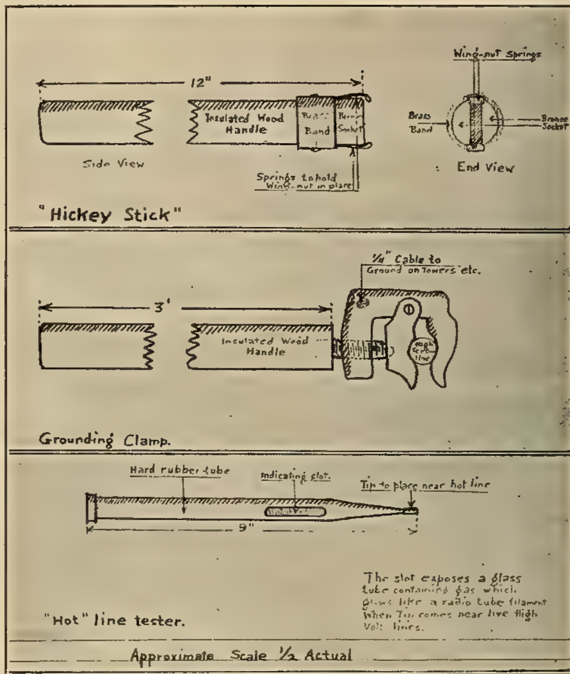
A demonstration of the use of these tools in actual maintenance service, close to the city of Fresno, was a feature of the National meeting of the Technical Section, attended by practically all of the members who were at that meeting.

The manner in which the team of three men (two linemen on the pole and one groundman) worked together with hardly a spoken word, but each right on the job as part of the team every second, was as impressive as the simplicity and speed of the operation, and the safety of it.

In conclusion it is suggested that some of the above devices or their equivalents should be in the equipment of every crew doing work of a character indicating their usefulness.

Lists of tools and protective equipment for each type of crew could and should be standardized at least by each company, there being few standards at the present time even within the companies.

The proper list should, in each case, be in the hands of the foremen of the crew, who should be required at all times to have such equipment available and in serviceable condition.



Figs. 8, 9 and 10 (Top to bottom)

A good workman is worthy of good tools and a safe workman must have safe tools. The work with which these devices are used is peculiarly hand or personal work, and the safety of the man is entirely dependent upon the reliability of the tools with which he works.

Any service, rendered by those entrusted with accident prevention, in promoting or developing tools for safe performance of necessary operation, is of great value.

Distribution Transformer Standardization

By N. B. HINSON*

THIS subcommittee had a small committee meeting of the members in and around Los Angeles and a tentative plan was outlined. The various phases that have been suggested such as case dimension, hanger dimension, arrangement of external leads, arrangement of terminal boards, electrical characteristics, cut-outs, etc., were discussed and the consensus of opinion was that we should consider the first two, that is, case and hanger dimensions at this time.

A blank form giving the main dimensions of 2,300-volt distribution pole type transformer was sent out to four of the manufacturing companies, namely the General Electric, Westinghouse, Maloney and Packard companies, and the data obtained was tabulated. It was found that the four companies named have case dimensions at this time (though this was not true some time ago), that for the same size are nearly identical, especially height and width, front and back. Any transformer of the same rating could replace another make without changes in the clearance to wires below the transformer.

When you look at the hangers such is not the case. In the standard sizes of 2,300-volt distribution pole-type

* Report of Subcommittee, Overhead Systems Bureau, Technical Section.

transformers, 1½ to 50 kva., there are for the four manufacturers many different hangers. There seems to be no reason why the main hanger dimensions could not be standardized, just as numerous other devices, without affecting the design of the main product.

By standardizing on one main dimension of hangers and transformer supporting lugs, four and perhaps two hangers would take all makes and sizes of pole-type 2,300-volt distribution transformers.

There has been some discussion regarding the elimination of that part of the hanger iron which sticks down below the bottom of the transformer case as the transformer cannot be set down with the hangers attached. Some Western operating companies are now using hangers with this part cut off. This extension has been

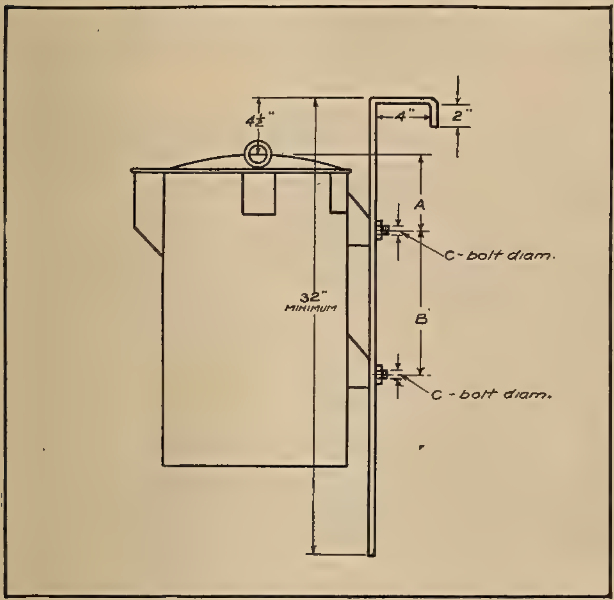


Fig. 1—Typical 5-kva. transformer on proposed standard hanger.

used by some companies to bolt the hangers to the heel arm, but the hole in the top bend of the hanger can be used to bolt the hanger to the top supporting arm when necessary.

The definite recommendations this committee has to make, which are concurred in by most of the member companies, especially those along the Pacific Coast are: (1) That the minimum length of transformer hanger be 32 in.; (2) That for transformers of 15 kva. and larger, the hanger should not extend below the bottom of the transformer case; (3) That all transformers should be designed to mount on the hangers so that the top of the case will be 4½ in. below the top of the hanger iron support; (4) That the hanger iron top should be designed to fit over a 4-in. crossarm and have a lip on the hook extending down 2 in. These dimensions are shown in Fig. 1. We would recommend that the various manufacturers get together and standardize on the dimensions "A" and "B" and diameters of bolts "C" for certain sizes of transformers. This would probably require two or at the most four hangers.

It has been suggested that all transformers larger than 25 kva. be carried in stock without hangers and that hangers for these sizes be purchased as extras. These larger size transformers are mounted on platforms in a great many cases and the hanger irons accumulate in the storeroom.

The fact was brought out that most Pacific Coast companies do not use the lugs on the secondary leads, but cut them off and these accumulate in stock, and that it would be advisable to furnish transformers without secondary lugs. The suggestion of using rigid secondary leads instead of the present flexible ones was discussed, but we have no definite recommendations to make at this time. This, together with the proposition of 4-coil secondaries permitting the use of transformers, either for 110-220 or 220-440 for primary voltages of 6,900 or higher, arrangement of terminal boards, primary cut-outs, etc., will give this committee material to start work on next year.

Testing High-Voltage Insulators in Service

Report of High-Voltage Insulator Committee, Overhead Systems Bureau, Technical Section*

It has been the endeavor of this committee to gather data covering the methods in use in testing high-voltage insulators in service by the member companies and also to get information regarding equipment either available or in process of development for making such tests.

The information obtained to date is not nearly complete but shows the following general practice. Nearly all companies reporting have used the megger test in the past with more or less satisfactory results. One company reports satisfactory results on suspension units with the megger except for the fact of its being sometimes impractical to de-energize a line. Another reports perfect satisfaction with the megger test for suspension units, but that it uses a spark coil and X-ray set for pin-type insulators. Another declares the megger impractical as it often shows a great many units as bad which are in reality O.K. Some very interesting comparisons of results from megger tests and standard 60-cycle and high-frequency tests were submitted by The Southern Sierras Power Company, reference to which will be made later.

Many of the replies indicate that a method of testing insulators while the lines are energized would be very acceptable. More or less experimental work has been done in this regard. This is particularly advantageous in view of the wide interest in "hot wire maintenance" of lines of medium voltage. Following is a report from the Southern California Edison Company regarding the development of an instrument for testing insulators while energized.

"Under present conditions no attempt is being made to test insulators in service. Our usual practice is to de-energize the line to make an insulation test of the individual units, checking up an insulator string by means of a megger. This method has been successful and satisfactory but has its limitation. It is quite difficult to test insulators on a certain line if no provision has been made to handle the service by means of another transmission line. Some lines can rarely be taken out of service.

"In the past some equipment has been developed for the testing of insulators while they were in service and the line was energized which offered considerable promise. This consisted of two aluminum vanes set inside of a square tube of bakelite around which a square tube of brass was mounted. Over this square tube of brass another square tube of bakelite was attached. The two aluminum vanes constituted one pole of the instrument, while the square brass tube constituted the other pole. From these two poles, or terminals, leads were brought to two middle prongs used for spanning individual insulators in an insulator string. The whole equipment was mounted on the end of a 5-ft. treated wood stick. In testing the individual insulators were spanned and the defective insulator was indicated by a very slight movement of the aluminum vanes, whereas an insulator in first class shape would show a movement of about ½ in. in the ends of each of the two vanes. This equipment was developed for use on 10-kv. and 15-kv. distribution circuits and under experimental conditions it seems to be a very satisfactory and reliable instrument. However, it was found that the principle upon which this instrument operated was an apparent infringement upon one of the claims of O. F. Johnson who had developed the "buzz stick" method of insulator testing, consequently further development of this equipment was abandoned and it has not been used on our lines. The matter has lain dormant for approximately two years and the prospects for resurrecting it seem somewhat dubious at present. Apparently all schemes seem to be a violation of some

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part of Mr. Johnson's claim, and we feel that it would not be advisable to go further with the development of this equipment under the present conditions."

A report from the San Diego Consolidated Gas & Electric Company covering the use of the above mentioned equipment follows:

"We have found that testing line insulators in the field either in or out of service is not practicable because we are so near the sea coast that tests with a megger are useless and tests with other devices show so many insulators to be bad when they are not.

"No tests have been made during the past two years, but in 1922 tests were conducted on 11-kv. insulators using the Reed tester developed by the Southern California Edison Company. The report of the test was as follows:

" 'We have completed testing insulators on all 11-kv. feeders and results obtained as follows:

Total number of insulators tested	10,375
Total number of insulators found bad	1,337

" 'Of the above "bad" insulators twenty No. 3538 and twenty No. 3039 were selected at random and brought to the electric repair shop in the condition as found in the field and were tested, with the results as shown in Table I.

" 'Additional tests of strings (four in a string) of new tested insulators were made in the electric repair shop with 11-kv. impressed upon the string with result that the Reed testing stick showed one or more to be "bad." A known "bad" insulator was also tested with the stick and a "bad" result was obtained.

" 'Conclusion: From the above tests it would appear that the Reed testing stick will undoubtedly show up bad insulators, but also will show up as "bad" a large percentage of good insulators.' "

The report of The Southern Sierras Power Company covers work done some years ago on standard 10-in. disc suspension insulators. The failures of these insulators were due mainly to cracks in the porcelain head of the insulator. The report reads as follows:

"When this work was undertaken we had no precedent or past experience of other companies to follow. Being equipped with a 110- to 120-kv., 60-cycle transformer and a 110- to 125-kv. 200,000-cycle oscillator it was first decided to give each insulator unit a 30-sec. test with the 60 cycles flashover and 15-sec. test with flashover voltage from the oscillator.

"It was soon discovered that the majority of the bad units were discovered soon after the application of the stress and that a continued application of flashover voltage caused units to break down that apparently had some insulating value left in them.

"It was finally decided to discontinue the use of the 60-cycle voltage and to establish a routine test of 5-sec. application of the flashover voltage from the oscillator. This test will locate a very large percentage of the bad ones with an expenditure of a minimum amount of time.

"We have observed that our regular suspension type insulators with a 10-in. disc requires a voltage of about 80,000 to flashover.

"From the records made while testing at the steam plant with both 60 cycles and oscillator we found that while testing with the oscillator first we examined 716 units of which 187 bad units, or 26 per cent, were found with the oscillator, after which 113 more bad units, or 15 per cent, were found with the 60-cycle test. While testing with 60 cycles first we examined 897 units, of which 361 units, or 37.8 per cent, were found to be bad, after which 123 more bad units, or 12.8 per cent, were found with the oscillator test. While this would indicate that the 60-cycle test was more effective, it must be borne in mind that the 60-cycle test was for a period of 30 sec. and the oscillator for only 15 sec. Later, while in the neighborhood of the control station, we examined 198 units first with a 5-sec. 60-cycle test, finding one bad one, after which a 5-sec. oscillator test was applied to the same units, finding 24 bad ones, or 12 per cent. This result is quite different from the results obtained at the steam plant.

"Again, while at the steam plant, we examined 983 units with the high-tension megger finding 80 units, or 8 per cent, to be bad. When these units were subjected to a combined test of the 60 cycles and oscillator, we found 48 per cent to be bad. Later, while at Inyokern we tested 357 units first with the megger, after which they were given the regular 5-sec. oscillator test. The megger showed them all to be good, but the oscillator found 206, or 5 per cent, to be bad. This result illustrates how inadequate the megger is for insulator testing. The insulators at the steam plant probably had sufficient moisture in them to permit the megger to give a reading, while the bad ones at Inyokern were so dry after a hot dry summer that they all measured 'infinity.'

"To date we have examined a total of 47,989 units from the line, of which 12,439 units or 26 per cent have been found to be bad. So far the insulators have been found to be in the worst condition in the neighborhood

TABLE I.

No.	Style No.	Flash-over voltage	Punctured	Resistance in meg ohms Dirty	Clean
20	3538	Over 65 kv. each	No	300 to Inf.	Inf.
20	3039	Over 55 kv. each	No	170 to Inf.	Inf.

Note: Out of the group of twenty No. 3039 insulators one was found to be no good.

of Inyokern, where we tested 471 units, of which 243, or 51 per cent, were bad. The insulators which have been in the best condition have come from the neighborhood of the control station, from which in one week, we tested 1,730 units, of which 158 or 9 per cent were bad.

"We have made observations to determine whether insulators coming from one arm were in any worse condition than those coming from another. The results obtained were as follows:

	No. Tested	No. Bad	Per Cent Bad
Top arm	242	42	17
Middle arm	228	42	18
Bottom arm	233	43	18

"The results are so close that they may safely be called alike from all arms."

"We have also reviewed our records to determine if the position of the unit in the string had anything to do with its being bad. From the records of nearly 6,000 bad ones we have the following results:

	No. bad	Percent of total
No. 1 (nearest arm)	863	14.8
No. 2	972	16.6
No. 3	1,015	17.3
No. 4	971	16.6
No. 5	979	16.7
No. 6 (nearest conductor)	1,034	17.7

"Again we have observed that there is very little difference between dead-end suspension towers as far as bad insulators are concerned. This is shown by the following:

	Tested	Bad	Percent bad
Suspension towers	2,407	520	21
Dead-end towers	2,417	453	18.7

"We have found that a great majority of the insulators fail through cracks in the head of the unit; breakdowns occurring between the end of the pin and the inside of the iron cap. Only about 5 per cent of the failures have occurred through punctures outside of the iron cap. Most of these failures have occurred through original defects in the porcelain.

"We have not found that failures have occurred any more frequently among insulators of dark, than of light color, color being an indication of the extent of firing.

"There is one question which we consider important and which we have not been able to satisfactorily answer; that is, what takes place in an insulator between the time that the spark over voltage is applied and when failure occurs, which time may be 3, 4 or 5 sec.?"

The Great Western Power Company has developed a "Glow Stick" for testing insulators on lines operating at 22 kv. and under, which has proved very satisfactory in practice. It consists of two terminals shaped to span the insulator under test. An air gap, condenser and electrostatic glow lamp are connected between these terminals, the lamp being encased in a black enameled hood to help visibility. The equipment is mounted on an insulated wooden handle and the lamp so situated that it may be seen easily by the operator.

The San Joaquin Light & Power Corporation has in use a portable radio receiving set which was built primarily to chase down radio trouble but has proved

quite efficient to detect leaking insulators as well. Aside from the use of this set the megger has been used with quite satisfactory results. Recently a large number of old pin-type 60-kv. insulators which were salvaged from a line have been tested with the megger. They have shown a large percentage bad. It is the intention to check this test with a laboratory test, the results of which will be available for a future report.

The subject of hot wire maintenance was added to this committee's work at the Fresno meeting. There has been developed by the San Joaquin Light & Power Corporation a set of insulated handled tools for this purpose which have proved very satisfactory. The tools have been used on their 11-kv. lines for about eighteen months and some work has been done on 30-kv. lines with them. There is in each district a "hot wire crew" consisting of two linemen and one groundman who do all the 11-kv. hot wire work and in addition handle the patrolling of the more important lines. By the use of the tools they are able to repair faults immediately when found and thus in most cases save possible serious damage that would cause an interruption of service. In addition they follow up the line crews and do such work as transferring hot lines to new poles set in line, make permanent taps to existing hot lines for new extensions and in general handle any work of a hot nature.

On the San Joaquin system these hot wire crews have been a big success as is shown in Table II which summarizes the work done during the first three months in 1925. By subtracting the total in column 8 from column 12 it may be noted that 656 crew hours or 32 crew days have been saved by using the hot wire tools and by subtracting the total in column 9 from column 13 that 6,363 miles less distance has been covered by the crews in going to and from work. The savings in these two items alone may be figured as follows:

TABLE II.—Hot wire tool report of San Joaquin Light & Power Corporation Jan. 1, 1925 to March 31, 1925.

	Work performed using hot wire tools								Necessary if same work performed without hot wire tools			
District	Dead-end insulators replaced	Broken pin type insulators replaced	Broken fuse contact insulators replaced	Broken or rotted pins replaced	Jumpers made permanent	New poles tied in line	Crew hours to perform work	Miles driven to perform work	Transformer banks out of service	Sectionalizing switches to operate	Crew hours to do work	Miles driven to do work
Madera	42	10	....	3	158	11	122	1,445	1,108	197	202	2,014
Fresno	159	43	24	29	382	32	464	2,490	2,077	765	636	4,307
Selma	38	17	5	2	206	48	231	1,689	3,577	310	431	3,160
Merced	387	54	9	19	146	7	207	1,455	1,484	261	318	2,555
San Joaquin	156	16	....	1	58	3	51	504	1,110	101	69	853
Dinuba	148	3	....	....	99	7	115	711	1,120	180	136	1,170
Corcoran	353	43	....	2	85	23	142	933	2,282	178	196	2,541
Totals	1,283	186	38	56	1,134	131	1,332	9,237	12,758	1,992	1,988	16,600

82 Crew days saved at $18.50 = $1,437.00
6,363 Miles saved at 0.06 = 381.78

Saving in labor and mileage = 1,818.78

The saving effected in labor and mileage alone is quite an item but the big advantage is in the maintenance of continuous service that the tools made possible. In handling this work on the San Joaquin system there has not been a single accident.

It is our recommendation that the work of this committee be continued next year and that the subject of "hot wire maintenance" be assigned to it also. It is our thought that the two subjects are closely allied and, with the ever increasing necessity of continuous operation, hot wire work for all voltages is being forced upon the operating companies.

Various Phases of Metering

Report of Meter Bureau, Technical Section*

IT has been the effort of the Meter Bureau to limit the year's work to a few important subjects, it being our belief that by so doing more complete and authoritative reports could be compiled with less burden upon the membership. Eight subjects were undertaken, details of which are given later in this report. A brief outline of these subjects with recommendations for the future may perhaps be in order at this point.

The education of meter men has been a live subject for three years, the efforts of the bureau being directed toward cooperation with the University of California in the presentation of short courses for meter men during the summer session. The courses have been very successful, both from the point of view of the men enrolled and of the utilities by whom they are employed, and it is planned to make these courses a permanent feature.

The bureau has been gathering data relating to a meter test period for some years, and recommends that this study be continued.

A committee on safety rules and test facilities serves as a point of contact with the Safety Rules Bureau, and its continuance is recommended.

The use of oil in meter bearings has been studied in the past from utility experience, and this year's report is based on material obtained from the meter manufacturers. The bureau feels that no further information is obtainable at the present time, and suggests that the subject be temporarily discontinued.

Maintenance of relays has been a subject of past study and its continuance is recommended. This year's effort has been directed toward an investigation of the effect of wave form on time of operation of induction relays, and a very complete report has been prepared with recommendations covering test methods to obviate errors insofar as possible.

A paper on low cost high-tension metering of sufficient accuracy for operating purposes, though not necessarily accurate enough for billing, is presented, and further study of this subject is suggested.

The committee on new developments has reported a number of interesting matters and the bureau offers the recommendation for next year that an investigation be made of some of the devices covered by this report.

The proper size of meter for various different classes of installation is a new subject which was undertaken this year. A considerable amount of data has been gathered but the membership feels that collection of further information is desirable.

* G. H. Searle, Pacific Gas and Electric Company, chairman; J. E. Bridges, Westinghouse Electric & Manufacturing Company; J. C. Abel, Western States Gas & Electric Company; J. C. Albert, Los Angeles Bureau of Power and Light; A. F. Blecksmith, Duncan Electric Manufacturing Company; T. S. Capek, Pacific Gas and Electric Company; G. A. Collins, San Joaquin Light & Power Corporation; L. Conrad, Southern California Edison Company; R. Crowell, Pacific Gas and Electric Company; R. S. Daniels, The California Oregon Power Company; R. S. Duesbury, Western States Gas & Electric Company; E. Ealson, Southern California Edison Company; W. R. Frampton, Southern California Edison Company; T. P. Garrett, San Diego Consolidated Gas & Electric Company; C. F. Gilcrist, San Joaquin Light & Power Corporation; A. J. Hall, Ontario Power Company; Lou Johnston, San Joaquin Light & Power Corporation; R. G. Jones, The Southern Sierras Power Company; T. E. Knackstedt, The California Oregon Power Company; W. G. Knight, Great Western Power Company; O. A. Knopp, Pacific Gas and Electric Company; W. N. Lindblad, Pacific Gas and Electric Company; W. A. McMeekin, Los Angeles Gas & Electric Corporation; L. A. Mott, Sangamo Electric Company; J. H. Paget, Great Western Power Company; A. S. Price, Southern California Edison Company; F. A. Redding, Southern California Edison Company; J. J. Skinner, The California Oregon Power Company; D. D. Smalley, Midland Counties Public Service Corporation; W. E. Smith, General Electric Company; W. H. Talbott, San Diego Consolidated Gas & Electric Company; L. D. Tycer, Pacific Gas and Electric Company; W. C. Wells, The California Oregon Power Company.

An important feature of the year's work has been a closer cooperation with the Meter Committee of the National Electric Light Association than has been possible in the past. Requests for information and opinions have been received from several of the chairmen of subcommittees of the national Meter Committee. All such requests the Meter Bureau has endeavored to answer promptly and fully. In this connection it seems timely to remark that those desiring information should make due allowance for our geographical location and the wide territory over which the Pacific Coast Electrical Association membership is spread. As much time as possible should be allowed for gathering data, and for correspondence between the chairman and members of the bureau in order that the information secured may be compiled with the greatest care and the opinions offered may accurately reflect the consensus of opinion of the membership. It is our earnest hope that cooperation with the national Meter Committee shall continue, as on it our success depends in a great measure.

Education of Metermen

The second annual Short Course for Metermen was held at the University of California at Berkeley, May 19-24, 1924. It had been found in 1923 that the greater demand for instruction came from men of some considerable experience in meter work. It is of course necessary to provide instruction also for the comparatively inexperienced, and the 1924 course was accordingly planned to give the necessary work for beginners, and with optional experiments of a more advanced nature.

Allyn G. Smith of the technical department of the Extension Division of the University, made arrangements for the course, which was presented by the members of the electrical engineering department faculty. In addition to the faculty members, lectures were given by W. N. Lindblad, Pacific Gas and Electric Company; A. V. Guillou, California State Railroad Commission, and O. A. Knopp, Pacific Gas and Electric Company. Representatives of the manufacturers arranged for the loan of apparatus, which was found very helpful.

Forty-nine men attended the course, of whom fourteen had attended the previous course. It is felt that the instruction was of great benefit to all who participated, and it is of interest to note that a resolution of appreciation was adopted and signed by the men in attendance.

The schedule of lectures was as follows:

One Lecture—Fundamental Electrical Principles.
One Lecture—Indicating Meters.
Three Lectures—Principles of Alternating Currents.
One Lecture—The Induction Principle.
One Lecture—The Single Phase Watthour Meter.
Two Lectures—The Polyphase Watthour Meter.
One Lecture—Demand Meters.
One Lecture—Instrument Transformers.
One Lecture—Protective Relays and Their Uses.
One Lecture—The Mechanical Construction of Electric Light and Power Rates.

The course embraced the following laboratory experiments:

1. Series and Parallel Resistances.
2. Alternating Current Measurements.
3. Power and Power Factor in Three-Phase Circuits.
4. Instrument Transformer Connections.
5. Test of Single-Phase Watthour Meters.
6. Single-Phase Watthour Meters on Polyphase Circuits.
7. Test of Polyphase Watthour Meters.
8. Examination of Maximum Demand Indicators.
9. Test of Maximum Demand Indicators.
10. Examination and Test of Induction Overload Relays.
11. Transformer Load Test.
12. Calibration of Indicating Instruments.
13. Measurements of Kva.
14. Performance of an Instrument Transformer with Change of Secondary Burden.
15. Standardization of a Rotating Standard.
16. Oscillograph Study of Third Harmonic Effect in Transformers.
17. Oscillograph Study of Current Transformers on Open Circuit.
18. Inspection and Operation of Various Types of Protective Relays.
19. Examination of Single-Phase Watthour Meters.
20. Examination of Polyphase Watthour Meters.

Mr. Duesbury and Mr. Redding have been conducting arrangements with the University for a third annual course. It was expected up to very recently that this course would be given May 11-16, 1925, but word received from the University would make it appear that it may be impossible to present a meter course this year. This is due to no lack of attention on the part of the Meter Bureau or its representatives, but rather to inability of the electrical department of the University to handle the work. Owing to late receipt of this word from the University it is probably impossible to arrange for the instruction to be given elsewhere.

Meter Test Period

The Meter Bureau has for some years been gathering information relative to the sustained accuracy of watthour meters. Compilation of data is being continued, but material received since the last report is not of sufficient volume to warrant further report at this time. It is the announced intention of the bureau to continue this study.

Safety Rules and Test Facilities

As safety rules are of vital interest to the Meter Bureau, a committee was formed to provide a means of keeping the members in touch with the work of the Safety Rules Bureau and to gather information relative to new developments in the field of testing facilities. As there have been no noteworthy developments, no report is offered at this time.

Use of Oil in Meter Bearings

By E. A. EALSON*

IN an effort to obtain a wide and expert opinion on this subject a questionnaire was submitted to the leading meter manufacturers. The result showed a diversity of opinion from the various standpoints involved. Out of four questionnaires, three submitted data and since the fourth did not, we are led to believe that they do not consider the use of oil in meter bearings necessary.

Three of those supplying information were agreed that oil on the lower jewel bearing was advisable, also that the jewel bearing should be cleaned and oiled on each test and a liberal amount of oil applied.

One method of applying oil to bearings in the laboratory was with the aid of a pipette. This is a glass tube similar to a thermometer tube having a small aperture with both ends open. The oil is drawn into the tube by means of a vacuum and is held there by capillary attraction, but when it touches a jewel surface, it runs out, filling the cup. Another method suggested was the use of a watchmaker's glass oil cup. This cup is provided with only a few drops of oil at a time and can be kept covered when not in use. The oiler may consist of a short piece of .015 brass or phosphor bronze wire inserted in a small wooden handle. The end of this wire may be spread out and flattened slightly at the extreme point which operation will enable the oiler to retain a drop of suitable size when dipped in the oil receptacle before mentioned. This oil cup is shallow to prevent the oiler from being dipped too deeply into the oil, thus retaining too large a drop,

No better method of oiling jewel bearings in the field was suggested than that of carrying a small bottle of oil which is transferred to the jewel by means of a suitable oiler, perhaps like that one just mentioned. Another suggestion was that the oil be applied to the jewel bearings in the laboratory and carried in suitable containers and the jewel bearings be interchanged in field at the time of test.

The majority of those reporting favored the use of oil having a mineral base while the minority was very emphatically in favor of a fish oil. Both advanced strong arguments for their choice which should be given due consideration.

It is conceded that oil suitable for this purpose should be one which will not turn rancid, evaporate or oxidize when exposed to light and air of varying temperatures. It should possess film forming characteristics and absorption properties to reduce friction at speeds required. It should not corrode, harden or gum after continued use.

Those favoring the use of oil of a mineral base feel that it satisfies most perfectly the aforementioned characteristics and point out that fish or porpoise oil has a serious objection due to its tendency to become rancid after extended use. Those favoring the fish or porpoise oil point out that the watch trade attribute the results of pivot and jewel bearings becoming oxidized and forming an abrasive, thus causing wear on the jewel, to other sources than the property of the oil.

* Report of the Meter Bureau, Technical Section.

They also point out that the fish oil possesses lubricating characteristics far superior to those of an oil of mineral base. This is due to the fact that the petroleum oil has a tendency to spread and thus evaporate, the net result being that in order to obtain the required results more of the mineral oil must be applied than when fish oil is used.

Due to the information which is available, your committee has no definite recommendations to offer relative to the superiority of either oil, but would suggest that the member companies continue the study of this subject in a systematic manner. This would require the setting apart of a certain number of meters operating under varied conditions and a tabulation of the results obtained over a suitable period of time. This would supply concrete facts which are not available at the present time.

High-Tension Metering for Operating Purposes

By W. N. LINDBLAD*

THE scope of this committee was to cover the investigation of the means of reducing the high cost of metering circuits of 15,000 volts and over where the meter record was not to be used in the sale of power but merely for recording an interchange of power between districts, substations or power houses within a company. For the sake of arriving at some basis of necessary accuracy, an arbitrary value of plus or minus 3 per cent was selected as being satisfactory for this class of metering.

Current Transformers

The most obvious method that suggests itself for reducing the current and providing sufficient insulation for such installations is the bushing-type transformer. This transformer is wound on a ring core which is slipped over the high-tension bushing of the power transformer or oil switch. The single lead wire going through the bushing, thus becomes the primary winding of the transformer. A 100,000-volt General Electric bushing transformer was rewound for 100 amp. primary current and tested for ratio and phase angle. A burden of one 5-amp. watthour meter and 40 ft. of No. 10 wire were applied to the secondary.

Results

100 per cent Load: Ratio C.F.= .903 Phase Angle =4 deg. lead 58 min.

10 per cent Load: Ratio C.F.=1.156 Phase Angle =13 deg. lead.

These results show that the ordinary bushing transformer for high voltages and low currents (100 amp.) is entirely impractical for metering purposes.

Brooks Bushing Transformer

The Brooks type of bushing current transformer has been suggested for eliminating some of the inherent errors in bushing transformers. It was not possible to obtain one of these for test, but following are correction values submitted by one of the manufacturers for a 200-amp., 80,000-volt Brooks type bushing transformer:

100 per cent Load: Ratio C.F=1.00 Phase Angle = 0 min.

10 per cent Load: Ratio C.F.=1.00 Phase Angle =100 min.

It is apparent from these results that such a bushing transformer is satisfactory for this class of metering. It requires a special type of watthour meter with double current coils.

The Pacific Electric Manufacturing Company has developed a wound-type current transformer for insertion in the high-voltage circuit of an oil switch or transformer and to be immersed in the oil inside of the transformer or oil switch tank. Its object is to replace the bushing-type current transformer and since it is of the wound type it can be made much more accurate. A 150-amp., 60,000-volt transformer was obtained and tested as follows with one watthour meter burden:

100 per cent Load: Ratio C.F.=.982 Phase Angle =35 min.

10 per cent Load: Ratio C.F.=.977 Phase Angle =60 min.

The particular transformer tested had been compensated for relay burdens but could readily, by the addition of several turns on the secondary, be compensated so as to be within one-half per cent on ratio error with one watthour meter burden. Where there is room for the installation of this transformer it would be satisfactory for this class of metering.

Potential Transformer

The question of a substitute for the high voltage potential transformer is more difficult than with the current transformers. Several methods have been suggested as: (1) condensers or condenser bushings with a tap taken out to give partial voltage to the meter; (2) a very high resistance in series with a step-up current transformer which would supply potential current to the meter. So far nothing of really practical value has been heard of.

Where the power is transmitted over a 4-wire, 3-phase system and the system is fairly well balanced, a single-phase meter measuring power on one leg only is used by some companies. In this case the degree of accuracy is dependent on the degree of unbalance of the system. In most substations there is usually installed at least one potential transformer per circuit for synchronizing and voltage reading purposes.

In step-up or step-down substations it is often possible to obtain voltage for metering the high-tension circuits on the low-voltage side of the transformers. The accuracy in metering in these cases is dependent on the correctness of the determination of ratio of the transformers and upon their regulation characteristics.

* Report of Meter Bureau, Technical Section.

New Development in Electric Meters

By J. H. PAGET*

THE manufacturing companies report the following new meter developments:

Duncan Electric Manufacturing Company

1. Three-wire a.c. meters, 5 to 300 amp. can be furnished with six binding posts, i.e., with the potential leads disconnected from the current coils. This allows the potential of the meter to be connected ahead of the fuses.
2. An improvement has been made in the top bearing pin of all meters, by which cleaning and straightening of the pin is facilitated.
3. A removable guide ring at top of shaft, facilitates cleaning.

Sangamo Electric Company

1. Maximum demand meter with five minute interval.
2. Horizontal polyphase watthour meter with demand attachment.
3. Distant demand dial for ten watthour meters.
4. 6-terminal, 3-wire, S.P. meters.

Westinghouse Electric & Manufacturing Company

1. Type OB watthour meters.
2. Three-element watthour meters with separate elements and one moving element, both house and switchboard types.
3. Complete line of a.c. (type LY) and d.c. (type LX) switchboard instruments with 5½-in. diameter.
4. New line of electric tachometers.

General Electric Company

1. Six-terminal, single-phase, three-wire meters.
2. Type I 14 meters are to have an interior finish, consisting of electrogalvanizing sprayed with a very thin coat of aluminum paint. The front and back plates of the register will be of white metal. The exterior finish will be the usual black. This change is expected to reduce to a minimum any tendency to flake off, due to the much lighter coating, to be more durable, and to facilitate inspection.
3. Temperature compensation for Type I 14 meters. The compensator comprises a small piece of tempera-

* Report of Meter Bureau, Technical Section.

ture sensitive alloy mounted in the magnet shoe. Changes in temperature of the meter result in changes in the permeability of this alloy which, therefore, shunts more or less flux from the active gap of the magnet. Since the temperature characteristics of the ordinary induction meter are not the same on loads of different power factor this compensation will be correct for a given power factor only. Since the bulk of the single phase loads run close to unity power factor a compensator of this kind embraces the average service condition.

4. Changes in Type G demand meter. Several changes have been embodied in the Type G demand meter which will now be known as the G-8. The stylus actuating mechanism is to be equipped with a totalizing register thus providing a means of checking the number of impulses against the watthour meter with which it is coupled.

The double coil armature construction will replace the spring return heretofore standard. The D-3 (3-wire) type of contact will be used. A modification in the armature eliminates any tendency to overshoot on high voltage. An adjustable zero stop insures the sliding pinion always meshing with the intermediate gear when the stylus resets.

5. Contact device. This manufacturer contemplates standardizing on the use of the Type D-3 (3-wire) contact device for all demand meters. This will mean a change to two-coil armature construction sometimes referred to as the electromagnetic armature return. As a result of a careful study of the contact device design, a modified construction has been developed for the principal types of meters. The object has been to minimize friction, simplifying its adjustment and secure maximum reliability. This will be in production at an early date.

6. A complete line of round pattern d.c. and a.c. switchboard instruments 7½ in. in diameter.

Pacific Electric Manufacturing Company

A current transformer to take the place of the ordinary bushing type of current transformer. This transformer is reported to have an accuracy which is practically equal to a modern metering current transformer. O. A. Knopp, one of our members, assisted the manufacturer in designing this transformer.

Member Companies

O. A. Knopp, one of our members, has recently made the following interesting developments:

A multi-range current transformer has been designed with the object of providing a self-calibrating precision standard of a multiplicity of ranges. After calibrating the transformer 1-1 on various burdens it is possible to calibrate, with great precision, current transformers of any range provided for by the standard by using either the Silsbee deflection method or the Silsbee null method.

A multi-range potential transformer which has a utility similar to that of the above described current transformer.

Proper Sizes of Meters for Various Installations

By C. F. GILCRIST*

AN endeavor was made to secure from the various members certain information regarding consumers of the following classes:

1. Any form of industrial plant, either power or lighting service.
2. Heating, or heating and cooking installation, either domestic or commercial.

For each case submitted the following data was requested:

1. Class of service.
2. Kilowatt capacity of utilization apparatus.
3. Kilowatt-hour consumption per year.
4. Highest monthly maximum demand.

Information was received relating to over three hundred installations. These data are listed in the appendix as well as a summary of the results. It will be seen that there is a rather wide variation in some cases from the average value so that it is not possible to apply the figures very closely. On account of the variations in individual installations we feel that it will always be necessary to use considerable judgment in the selection of metering equipment for a specified case. However, there is no question that figures such as collected may be of considerable assistance. Particularly as the information submitted for some of the classes covered so few installations we believe it would be advisable to make a further effort to collect additional information so that a more representative average might be secured.

We wish to thank the following members of the Meter Bureau for their assistance and cooperation in collecting the tabulated information:

W. R. Frampton, Southern California Edison Company.

George H. Searle, Pacific Gas and Electric Company.

R. Crowell, Pacific Gas and Electric Company.

J. C. Abel, Western States Gas & Electric Company, Stockton.

R. S. Daniels, California Oregon Power Company, Medford, Ore.

A. L. Duesbury, Western States Gas & Electric Company, Richmond.

APPENDIX

Class	No. of installations	Average percentage of maximum demand (15 min.) to installed capacity.	No. of installations whose percentage of maximum demand to installed capacity does not differ from the average by more than 15 per cent.
1—Factories	79	46	18
2—Auto shops	8	40	5
3—Creameries	5	63	..
4—Printing Shops	14	47	6
5—Hotels	9	60	3
6—Warehouses	7	39	2
7—Woodworking plants	31	60	10
8—Packing houses	22	66	10
9—Refrigerating plants	8	86	3
10—Theaters	4	78	1
11—Foundry and machine shops	33	38	10
12—Laundries	7	62	2
13—Stores	13	57	4
14—Telephone plant	1	73	..
15—Office building	11	47	1
16—Quarries	4	61	2
17—Oil refineries	4	68	..
18—Miscellaneous	43	61	14

Installed kw.	Highest kw. demand for year	Demand period in minutes	Kw-hr. per year	Months operated	Demand percentage of installed kw.
		1—Factories			
74.6	40.0	15	5,000	12	54
91.0	82.0	15	3,200	12	90
77.1	49.2	15	6,000	12	64
70.1	13.4	15	400	12	19
447.0	127.0	15	35,000	12	28
873.0	39.5	15	8,900	12	45
33.5	8.2	15	300	12	24
126.5	33.5	15	4,000	12	26
50.0	15.7	15	3,200	12	31
70.9	42.8	15	4,000	12	60
130.7	69.8	15	2,500	12	53
287.0	61.1	15	15,000	12	21
79.0	17.9	15	2,500	12	23
82.0	20.1	15	4,700	12	25
143.0	67.0	15	42,000	12	47
31.3	3.28	15	10	12	10
110.5	61.7	15	33,000	12	56
41.0	31.7	15	9,000	12	77
38.8	22.5	15	11,500	12	58
39.5	1.12	15	10	12	2.8
38.0	11.9	15	2,100	12	31
44.8	28.7	15	8,500	12	64
99.2	29.1	15	6,000	12	29
331.0	159.2	15	20,000	12	48
51.4	24.0	15	6,200	12	47
104.4	26.1	15	4,000	12	25
73.7	21.5	15	2,000	12	29
97.0	28.9	15	4,000	12	30
80.6	44.7	15	4,600	12	45
91.7	29.3	15	4,500	12	32
74.6	25.3	15	500	12	34
83.0	9.48	15	1,300	12	11
141.6	52.9	15	10,000	12	37
606.0	224.0	30	65,000	12	37
138.7	47.7	15	6,500	12	34
55.2	19.0	15	5,000	12	34
331.0	179.0	15	40,000	12	54
80.6	31.3	15	5,400	12	39
161.0	22.4	15	3,000	12	14
55.2	21.4	15	2,300	12	39
55.9	20.1	15	3,500	12	36
40.3	23.8	15	2,400	12	59
184.9	67.0	15	10,000	12	36
685.0	215.0	30	45,000	12	31
186.6	186.0	30	294,780	12	100
159.0	77.0	30	159,840	9	48
55.2	8.0	30	1,110	5	14
339.0	94.0	30	68,920	6	28

* Report of Meter Bureau, Technical Section.

Installed kw.	Highest kw. demand for year	Demand period in minutes	Kw-hr. per year	Months operated	Demand percentage of installed kw.
501.0	157.0	30	342,720	12	31
85.0	68.0	30	142,000	12	80
121.5	76.0	30	53,240	12	63
1,176.0	549.0	30	835,200	12	47
968.0	588.0	30	828,240	9	61
94.7	50.0	30	78,750	6	53
77.7	62.0	30	34,200	12	80
133.0	46.0	30	27,040	6	35
376.0	220.0	30	337,600	12	59
113.0	37.5	30	29,100	7	33
414.0	230.0	30	74,220	12	55
54.4	51.0	30	161,424	12	94
130.8	84.0	30	131,820	12	64
85.8	65.0	30	34,080	12	76
113.0	120.0	30	115,440	10	106
74.6	45.0	30	17,070	10	60
117.0	80.0	30	188,140	12	63
174.0	81.0	30	288,180	12	47
1,160.0	1,040.0	30	459,840	12	90
557.0	288.0	30	615,360	11	52
77.6	30.0	30	146,460	12	39
276.0	180.0	15	531,300	12	65
106.8	36.0	15	39,020	12	34
113.0	52.8	15	141,480	12	47
104.0	56.4	15	69,064	12	54
22.8	8.13	15	2,740	12	36
39.2	30.6	15	31,920	12	78
1,433.0	660.0	30	1,121,400	9	46
2,985.0	1,560.0	30	7,645,200	12	52
2,876.0	1,472.0	30	3,643,200	12	51
2,941.0	1,356.0	30	9,314,000	12	46
2—Auto Shops					
64.8	24.6	15	1,300	12	38
65.0	23.3	15	7,000	12	36
123.0	25.3	15	3,500	12	21
194.0	29.8	15	8,500	12	15
73.2	58.0	15	15,000	12	79
45.3	19.4	15	14,640	12	43
38.8	16.0	15	15,984	12	41
33.2	14.4	15	22,752	12	43
3—Creameries					
50.7	20.9	15	1,000	12	41
80.5	60.3	15	18,000	12	75
62.7	32.8	15	5,500	12	52
139.8	83.0	15	25,000	12	59
78.3	68.0	15	147,040	12	87
4—Printing shops					
70.1	23.0	15	1,500	12	33
100.0	53.0	15	7,500	12	53
68.6	35.8	15	5,000	12	52
52.2	18.6	15	2,600	12	30
478.0	236.0	15	40,000	12	49
722.0	179.0	30	70,000	12	25
83.6	8.93	15	2,000	12	11
51.4	42.5	15	5,000	12	83
104.4	52.2	15	10,000	12	50
140.3	63.6	15	10,000	12	45
58.6	45.1	15	5,600	12	77
20.5	9.0	15	7,000	12	44
176.2	57.7	15	131,400	12	33
175.4	122.4	15	101,280	12	70
5—Hotels					
31.3	12.1	15	1,150	12	39
12.7	14.9	15	2,100	12	117
117.0	50.7	15	12,210	12	43
28.4	20.5	15	11,000	12	72
17.2	8.94	15	4,000	12	52
170.0	60.3	15	25,000	12	35
313.0	135.6	15	80,000	12	43
69.8	48.0	15	136,500	12	69
54.1	36.9	15	100,496	12	68
6—Warehouses					
26.1	10.7	15	1,750	12	41
45.5	17.9	15	4,240	12	39
28.3	18.3	15	2,000	12	65
82.7	16.4	15	4,500	12	20
28.0	3.84	15	1,760	12	14
20.9	3.0	15	3,720	12	14
70.6	54.0	15	158,000	12	77
7—Woodworking plants					
68.7	28.6	15	3,000	12	42
73.1	55.9	15	5,500	12	76
56.0	39.3	15	6,500	12	70
77.7	79.9	15	5,000	12	103
59.7	61.4	15	7,000	12	103
163.0	64.7	15	9,500	12	40
75.3	32.2	15	4,500	12	43
33.6	20.9	15	1,400	12	62
74.6	16.8	15	1,700	12	23
222.0	86.3	15	12,000	12	39
122.4	52.2	15	8,000	12	43
1,180.0	552.0	30	1,232,400	12	47
553.0	306.0	30	546,600	12	55
194.0	36.0	30	3,790	8	19
84.3	33.0	30	26,100	9	39
43.3	51.0	30	119,520	9	118
163.6	73.0	30	43,280	8	45
399.0	192.0	30	303,360	12	48
85.0	59.0	30	3,380	12	69
81.2	22.0	30	25,290	12	27
591.0	370.0	30	674,400	12	63
356.0	135.0	15	98,240	12	38
122.6	77.8	15	69,360	12	63
44.4	27.8	15	26,540	12	63
174.0	120.0	15	153,180	12	69
408.0	218.0	15	316,040	12	53
25.0	19.2	15	18,016	12	77
39.5	43.1	15	34,050	12	109
605.0	444.0	15	893,560	12	73
480.0	312.0	15	584,030	12	65
570.0	368.0	15	743,920	11	65
8—Packing houses					
48.5	32.2	15	14,000	12	66
42.5	23.8	15	7,900	12	56
109.0	47.0	15	6,600	12	43
224.0	82.2	15	9,000	12	37
73.1	26.3	15	7,000	12	36
67.0	29.8	15	13,000	12	44
176.0	104.0	30	261,600	12	59
145.0	108.0	30	284,880	12	74
166.0	89.0	30	170,400	8	54
317.0	136.0	30	250,480	10	43
66.3	55.0	15	60,864	12	83
448.0	252.0	15	265,340	12	56
126.0	77.7	15	70,200	12	62
26.1	31.4	15	9,504	12	120
112.0	69.8	15	52,860	12	62
37.2	19.2	15	8,520	12	52
44.0	36.8	15	32,440	12	84
119.0	90.0	15	48,360	12	76
39.5	39.2	15	11,680	12	99
147.0	68.0	15	90,840	12	46
69.2	102.0	15	89,520	12	148
94.7	56.0	15	49,520	12	59
9—Refrigerating plants					
78.3	43.9	15	13,000	12	56
54.1	61.0	30	284,352	12	113
769.0	745.0	15	3,970,400	12	97
14.6	20.0	15	16,800	12	137
53.7	50.3	15	74,580	12	94
322.0	238.5	15	1,122,000	12	74
20.4	11.5	15	47,640	12	56
96.6	60.6	15	283,380	12	63
10—Theaters					
167.3	44.6	15	6,100	12	27
32.8	39.2	15	13,344	12	119
29.6	28.15	15	90,024	12	95
40.6	28.8	15	90,936	12	71
11—Foundry and machine shops					
152.0	40.6	15	5,000	12	27
424.0	67.0	15	11,000	12	16
53.0	12.4	15	3,000	12	23
42.5	14.9	15	3,200	12	35
101.0	12.2	15	1,500	12	12
69.2	34.6	15	7,000	12	50
53.7	15.9	15	2,800	12	30
140.3	52.1	15	10,000	12	37
97.0	38.0	15	5,000	12	39
78.3	33.8	15	5,000	12	43
37.2	27.7	15	3,500	12	74
39.5	2.61	15	200	12	6.6
44.0	10.7	15	1,000	12	24
71.6	13.4	15	1,000	12	19
176.0	50.1	15	2,700	12	28
82.0	27.7	15	6,000	12	34
44.8	9.1	15	1,100	12	20
216.0	25.1	15	3,500	12	12
25.4	6.41	15	3,200	12	25
43.3	12.1	15	1,800	12	28
276.0	116.0	15	17,000	12	42
129.0	31.0	30	40,368	12	24
133.5	72.0	30	80,880	10	54
618.0	200.0	30	313,400	7	32
215.0	62.0	30	52,560	9	29
170.0	56.0	30	58,710	10	33
107.0	43.5	30	70,560	12	41
41.0	63.0	30	49,980	12	154
85.8	57.0	30	5,820	4	66
109.6	52.0	30	38,120	12	47
55.6	31.9	15	22,460	12	57
67.8	19.95	15	8,100	12	29
76.3	30.5	15	35,520	12	40
12—Laundries					
50.7	33.5	15	8,000	12	66
87.2	39.1	15	9,500	12	45
96.3	55.6	15	12,000	12	58
147.0	60.2	15	10,000	12	41
50.0	36.5	15	12,000	12	73
51.1	38.9	15	62,840	12	76
28.5	21.7	15	36,576	12	76
13—Stores					
630.0	112.0	15	35,000	12	18
911.5	377.0	15	10,000	12	41
71.6	23.1	15	15,000	12	32
80.6	26.1	15	3,400	12	32
42.8	48.0	15	34,640	12	112
76.8	42.8	15	67,632	12	56
69.9	36.1	15	87,980	12	52
34.9	23.9	15	120,620	12	68
33.1	33.7	15	131,552	12	102
23.9	13.6	15	15,264	12	57
30.1	21.5	15	34,048	12	71
110.4	52.4	15	126,000	12	47
28.6	14.55	15	56,936	12	51
14—Telephone plant					
40.5	29.5	15	69,900	12	73
15—Office buildings					
53.0	7.97	15	1,800	12	15
21.6	20.3	15	1,300	12	94
34.3	17.1	15	4,250	12	50
38.1	13.4	15	3,500	12	35
64.2	21.1	15	5,000	12	33
129.0	90.6	15	21,000	12	70

Installed kw.	Highest kw. demand for year	Demand period in minutes	Kw-hr. per year	Months operated	Demand percentage of installed kw.
85.0	20.8	15	7,000	12	24
124.6	45.5	15	15,000	12	36
63.0	21.0	15	42,270	12	33
83.3	29.3	15	86,424	12	35
54.7	51.0	15	41,206	12	93
		16—Quarries			
93.3	38.7	15	6,000	12	41
220.0	177.0	30	181,440	12	80
138.0	84.0	30	196,480	12	61
382.0	237.0	15	779,840	12	62
		17—Oil refineries			
116.5	110.0	30	41,360	11	94
53.7	45.0	30	45,560	12	84
261.0	128.0	30	60,160	11	49
1,724.0	740.0	30	2,516,000	12	43
		18—Miscellaneous			
54.4	5.96	15	400	12	11
201.0	9.7	15	1,500	12	4.8
50.0	23.8	15	6,000	12	48
97.7	23.9	15	3,000	12	25
339.0	206.0	15	40,000	12	61
76.4	51.7	15	20,000	12	68
158.0	89.4	15	15,000	12	57
205.0	111.8	15	18,500	12	54
21.6	15.7	15	2,500	12	73
38.8	10.6	15	3,000	12	27
78.0	54.3	15	5,200	12	70
59.6	20.8	15	2,500	12	35
82.0	26.1	15	1,000	12	32
123.2	16.4	15	1,700	12	13
35.1	1.57	15	150	12	4.5
6.71	15.7	15	1,700	12	224
38.1	9.46	15	3,000	12	25
225.0	61.8	15	12,000	12	27
455.0	106.0	15	385,280	12	23
235.0	60.0	15	219,600	12	25
370.0	250.0	15	489,360	12	67
373.0	326.0	15	526,080	12	87
116.0	76.0	15	59,600	12	66
160.0	93.0	15	703,520	12	58
1,320.0	710.0	15	2,582,400	12	54
117.6	66.0	30	60,480	5	56
52.2	56.0	30	107,640	12	104
63.4	54.0	30	29,460	12	85
28.4	30.0	30	5,550	12	103
89.6	110.0	30	115,720	12	123
164.0	112.0	30	198,960	12	68
102.3	76.0	33	34,520	8	74
70.1	30.0	30	25,160	12	43
48.1	37.0	15	39,920	12	77
23.9	17.3	15	14,200	12	72
40.6	19.2	15	82,128	12	47
37.7	25.55	15	83,984	12	68
26.1	42.0	15	12,240	12	161
15.3	10.5	15	5,012	12	69
74.6	51.9	15	21,240	12	70
24.4	11.2	15	2,160	12	46
34.3	16.5	15	9,210	12	45
436.0	192.0	15	488,880	12	44
205.0	34.9	15	5,000	12	17
31.9	22.1	15	9,160	9	69
77.6	38.3	15	31,856	12	49

Effect of Wave Shape on Time-Current Characteristics of Time Relays

Report of Committee on Maintenance of Relays, Meter Bureau*

THE purpose of these tests is to determine the effect of different types of loading devices on the time-current characteristics of induction relays and, if possible, adopt a standard method of loading comparable to service conditions.

Three types of induction relays were tested under as near the same conditions as possible. Each relay was tested on two current taps and points taken from 200 per cent to 1,000 per cent of these settings. Three checks were taken at each point and the average used.

Four different methods of loading were employed, as follows:

(1) General Electric meter loading rheostats practically non-inductive.

(2) States company's phantom load, consisting of a low-voltage, constant-potential transformer loaded by resistance on the secondary (low-voltage) side, known as phantom load "A."

(3) A low-voltage, constant-potential transformer controlled on the primary side by adjustable resistance, known as phantom load "B."

(4) A General Electric Type M.I.R.S. induction regulator, ratio primary 110/220, secondary 11/22 volts.

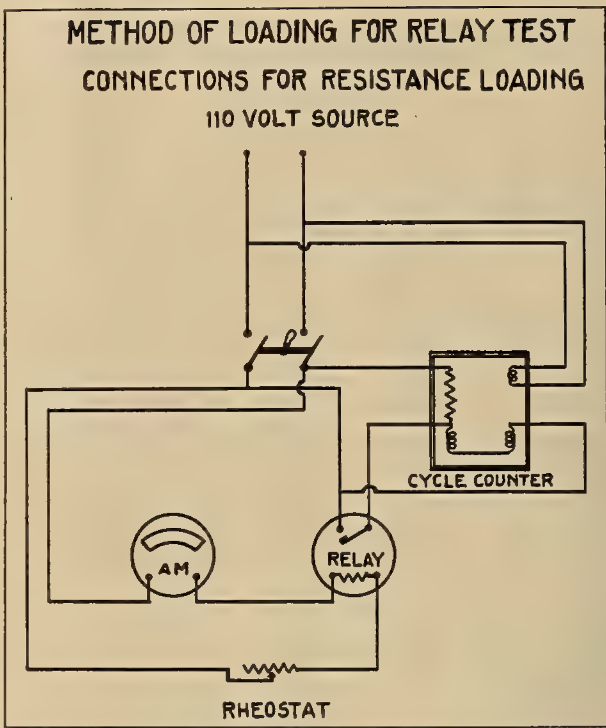

Fig. 1

Diagrams of connections are shown in Figs. 1, 2, 3, 4. A Westinghouse cycle counter was used to determine time.

Relays used were:

Westinghouse type CO standard, 4-12 amperes, 50 cycles.

Westinghouse type CO (low-energy), 4-12 amperes, 50 cycles.

General Electric type IA-101, 4-10 amperes, 50 cycles.

The results of these tests showing the time-current characteristics of induction relays as shown by different test methods are shown in Tables I to VI, inclusive, and in Figs. 5 to 9, inclusive.

Table No. VII is a summary tabulation showing average, maximum and minimum differences for all relays and all methods of loading.

Tables I and II give, in addition to the four methods

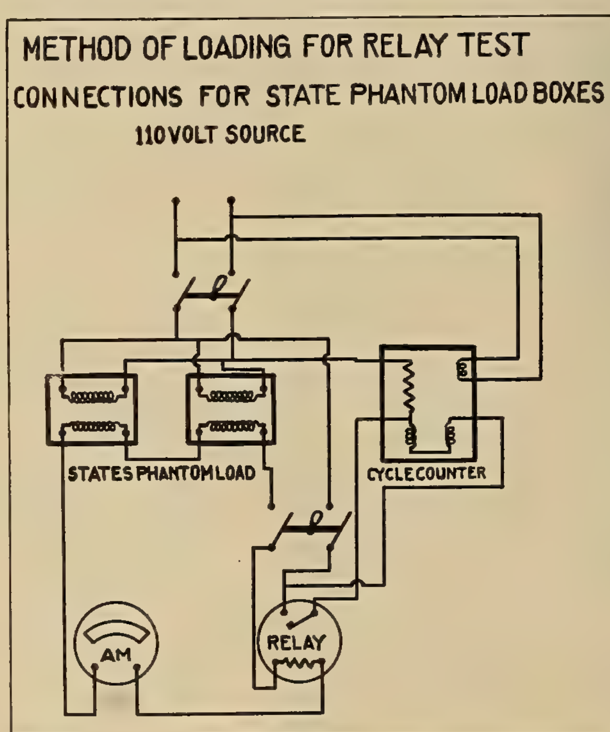

Fig. 2

*J. C. Alberts, Los Angeles Bureau of Power and Light, chairman; A. R. Arnold, Southern California Edison Company; J. C. Abbott, Southern California Edison Company; L. S. Conrad, Southern California Edison Company; E. A. Russell, Southern California Edison Company.

TABLE I

Relay: W. E. & Mfg. Co. type, CO standard, Serial No. 452371, 4/12 amp., definite minimum time 4 sec., Style No. 500052.
Ammeter: W. E. & Mfg. Co. Style 169514-C, Serial No. 296440, 20/40 amp.
Cycle counter: W. E. & Mfg. Co. Style No. 237124-A, Serial No. 395878.
Loading devices: G. E. meter testing rheostats.
Phantom Load "A"—States Co., #1152-1153.
Phantom load "B"—110/12-volt transformer controlled by primary resistance.
G. E. type M. I. R. S., induction regulator #3955853, 110/11 volts.

Relay data		Time index setting	Time from curve—in cycles	Resistance Loading Fig. 1 Oscillogram #138	Phantom load "A" Fig. 2 Oscillogram #141	Phantom load "B" Fig. 3 Oscillogram #144	Induction regulator Fig. 4 Oscillogram #158	Inverted current Transformer* Oscillogram #149
Amp. tap	Percent load			Time in cycles	Time in cycles	Time in cycles	Time in cycles	Time in cycles
4	200	5	129	130	130	138	133	130
4	300	5	95	100	105	110	104	102
4	400	5	86	88	95	100	94	89
4	500	5	84	85	92	95	88	82
4	600	5	80	80	87	95	85	77
4	700	5	77	78	87	95	83	75
4	800	5	76	76	86	..	83	75
4	900	5	74	75	85	..	83	73
4	1,000	5	74	75	85	..	82	74

*Westinghouse 10/5-amp. current transformer used inverted as phantom load with resistance control in primary connected as in Fig. 3.

TABLE II

Relay: W. E. & Mfg. Co. type CO standard, Serial No. 452371, 4/12 amp., definite minimum time 4 sec., Style No. 500052.
Ammeters: W. E. & Mfg. Co., Style No. 169514-C, Serial No. 296440, 20/40 amp.
Style No. 169517-C, Serial No. 274231, 60/120 amp.
Cycle counter: W. E. & Mfg. Co. Style No. 237124, Serial No. 395878
Loading devices: G. E. meter testing rheostats.
Phantom load "A"—States Co., #1152-1153.
Phantom load "B"—110/12-volt transformer controlled by primary resistance.
G. E. type M. I. R. S. induction regulator, 110/220 to 11/22 volts, sec. amp. 50.

Relay data		Time index setting	Time from curve—in cycles	Resistance Loading Fig. 1 Oscillogram*	Phantom load "A" Fig. 2 Oscillogram*	Phantom load "B" Fig. 3 Oscillogram #17	Induction regulator Fig. 4 Oscillogram #159	Inverted current Transformer Oscillogram†
Amp. tap	Percent load			Time in cycles	Time in cycles	Time in cycles	Time in cycles	Time in cycles
10	200	5	129	140	140	150	143	130
10	300	5	95	107	110	120	111	100
10	400	5	86	95	103	110	100	90
10	500	5	84	93	100	110	94	84
10	600	5	80	90	98	110	..	82
10	700	5	77	90	98	108	..	..
10	800	5	76	88	98	105	..	..
10	900	5	74	88	97	102	..	..
10	1,000	5	74	88	98	110	..	..

*No oscillograms taken on resistance and phantom load "A" because they were very nearly the same as on the 4-amp. tap of same relay.
†Westinghouse 10/5-amp. current transformers used inverted as phantom load with resistance control in primary, connected as in Fig. 3.

TABLE III

Relay: W. E. & Mfg. Co., type CO, low energy, Serial No. 581220, 4/12 amp., definite minimum time 2 sec., style No. 328860-A.
Ammeter: W. E. & Mfg. Co., Style No. 169514-C, Serial No. 296444, 20/40 amp.
Cycle counter: W. E. & Mfg. Co., Style No. 237124-A, Serial No. 395878.
Loading devices: G. E. meter testing rheostats.
Phantom load "A"—States Co., #1152-1153.
Phantom load "B"—110/12-volt transformer controlled by primary resistance.
G. E. type M. I. R. S. induction regulator, 110/220 to 11/22 volts, sec. amp. 50.

Relay data		Time index setting	Time from curve—in cycles	Resistance loading Fig. 1 Oscillogram #139	Phantom load "A" Fig. 2 Oscillogram #142	Phantom load "B" Fig. 3 Oscillogram #145	Induction regulator Fig. 4 Oscillogram #157
Amp. tap	Percent load			Time in cycles	Time in cycles	Time in cycles	Time in cycles
4	200	10	825	900	902	915	890
4	300	10	425	425	412	425	418
4	400	10	285	280	275	280	274
4	500	10	210	220	219	225	218
4	600	10	190	196	188	195	190
4	700	10	160	170	170	175	171
4	800	10	150	155	158	160	159
4	900	10	142	145	145	150	150
4	1,000	10	137	139	140	145	141

TABLE IV

Relay: W. E. & Mfg. Co. type CO, low energy, Style No. 328860-A, 4/12 amp., 50 cycles, definite minimum time, 2 sec., Serial No. 581220.
Ammeter: W. E. & Mfg. Co., Style No. 169517-C, Serial No. 274231, 60/120 amp.
Cycle counter: W. E. & Mfg. Co., Style No. 237124-A, Serial No. 395878.
Loading devices: G. E. meter testing rheostats.
Phantom load "A"—States Co., #1152-1153.
Phantom load "B"—110/12-volt transformer controlled by primary resistance.
G. E. type M. I. R. S. induction regulator, 110/220 to 11/22 volts, sec. amp. 50.

Relay data		Time index setting	Time from curve—in cycles	Resistance loading Fig. 1 Oscillogram*	Phantom load "A" Fig. 2 Oscillogram*	Phantom load "B" Fig. 3 Oscillogram*	Induction regulator Fig. 4 Oscillogram #156
Amp. tap	Percent load			Time in cycles	Time in cycles	Time in cycles	Time in cycles
10	200	10	825	867	851	860	827
10	300	10	425	406	395	415	397
10	400	10	285	270	265	273	262
10	500	10	210	220	210	218	210
10	600	10	190	185	182	185	...
10	700	10	160	168	162	170	...
10	800	10	150	155	150	155	...
10	900	10	142	145	140	145	...
10	1,000	10	137	136	135	137	...

*No oscillograms taken on resistance, or phantom loads "A" and "B" because there was the same general wave shape as on 4-amp. tap of this relay.

TABLE V

Relay: G. E. type IA-101, Style No. 174680763, 4/10 amp., 50 cycles, definite minimum time 3 sec., Serial No. 253591.
Ammeter: W. E. & Mfg. Co. Style No. 169514-C, Serial No. 296444, 20/40 amp.
Cycle counter: W. E. & Mfg. Co. Style No. 237124-A, Serial No. 395878
Loading devices: G. E. meter testing rheostats.
Phantom load "A"—States Co. #1152-1153.
Phantom load "B"—110/12-volt transformer controlled by primary resistance.
G. E. type M. I. R. S., induction regulator, 110/220 to 11/22 volts, sec. amp. 50.

Relay data		Time index setting	Time from curve—in cycles	Resistance loading Fig. 1 Oscillogram #140	Phantom load "A" Fig. 2 Oscillogram #143	Phantom load "B" Fig. 3 Oscillogram #146	Induction regulator Fig. 4 Oscillogram #161
Amp. tap	Percent load			Time in cycles	Time in cycles	Time in cycles	Time in cycles
4	200	10	450	480	460	480	476
4	300	10	295	300	310	320	330
4	400	10	250	250	250	262	267
4	500	10	205	210	220	235	233
4	600	10	194	191	198	210	211
4	700	10	183	175	185	196	194
4	800	10	172	165	175	185	183
4	900	10	161	162	167	176	171
4	1,000	10	150	150	160	171	163

TABLE VI

Relay: G. E. type IA-101, Style No. 174680763, 4/10 amp., 50 cycle., definite minimum time 3 sec., Serial No. 253591
Ammeters: W. E. & Mfg. Co. Style No. 169514-C, Serial No. 296444, 20/40 amp.
Style No. 169517-C, Serial No. 274231, 60/120 amp.
Cycle counter: W. E. & Mfg. Co. Style No. 237124-A, Serial No. 395878.
Loading devices: G. E. meter testing rheostats.
Phantom load "A"—States Co., #1152-1153.
Phantom load "B"—110/12-volt transformer controlled by primary resistance.
G. E. type, M. I. R. S., induction regulator, 110/220 to 11/22 volts, sec. amp. 50.

Relay data		Time index setting	Time from curve—in cycles	Resistance loading Fig. 1 Oscillogram*	Phantom load "A" Fig. 2 Oscillogram*	Phantom load "B" Fig. 3 Oscillogram*	Induction regulator Fig. 4 Oscillogram #160
Amp. tap	Percent load			Time in cycles	Time in cycles	Time in cycles	Time in cycles
10	200	10	450	455	467	490	455
10	300	10	295	311	325	313	312
10	400	10	250	257	255	260	253
10	500	10	205	220	226	220	220
10	600	10	194	204	205	205	...
10	700	10	183	190	192	192	...
10	800	10	172	177	180	182	...
10	900	10	161	170	172	173	...
10	1,000	10	150	163	158	...	...

*No oscillograms taken on resistance or phantom loads "A" and "B" as they are the same general shape as those on the 4-amp. tap of this relay.

TABLE VII

RELAY		W. E. & Mfg. Co. CO Relay—Standard			W. E. & Mfg. Co. CO Relay—Low energy			General Electric Co.—IA-101 Relay		
Amp. tap	Time index setting	Ave. % error	Max. % error	Min. % error	Ave. % error	Max. % error	Min. % error	Ave. % error	Max. % error	Min. % error
Resistance Loading*										
4	5–10–10	– 1.5	– 5.3	0	–3.2	– 9.1	0	–0.2	– 6.6	0
10	5–10–10	–13.9	–18.8	– 8.5	–0.8	+ 5.2	+0.7	–4.7	– 8.6	–1.1
Phantom load "A"										
4	5–10–10	–10.6	–14.8	– 0.8	–2.4	– 9.3	+1.0	–3.3	– 7.3	0
10	5–10–10	–22.8	–32.4	– 8.5	+1.8	+ 7.0	0	–5.9	–10.2	–2.0
Phantom load "B"										
4	5–10–10	–15.9	–23.4	– 7.0	–5.1	–10.9	0	–8.9	–14.6	–6.6
10	5–10–10	–33.7	–48.5	–16.3	–1.2	– 6.2	0	–5.5	– 8.9	–4.0
Induction regulator										
4	5–10–10	– 6.1	–12.2	+ 1.9	–3.1	– 7.9	0	–8.4	–13.5	–5.8
10	5–10–10	– 9.0	–11.9	– 4.7	+4.9	+ 8.1	0	–4.4	– 7.3	–1.1
Inverted 10/5 amp. current transformer										
4	5	+ 1.9	+ 3.7	– 0.7						
10	5	+ 0.9	+ 5.6	– 0.8						

*Errors shown on resistance loading are not due to method of testing but rather to the relay adjustment.

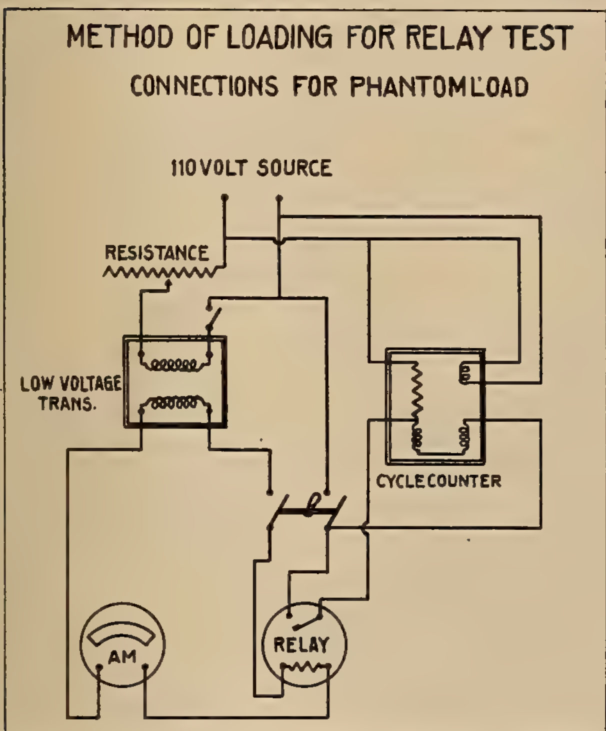

Fig. 3

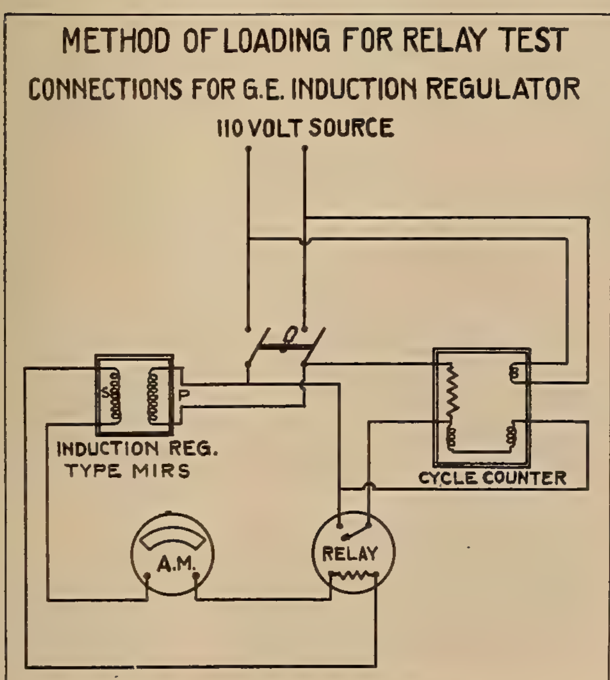

Fig. 4

of loading explained above, the results obtained by using an inverted current transformer of ratio 10 to 5.

This method was tried only on the standard CO relay since it was found that this relay was more susceptible to change of wave shape than the others.

Oscillograms of current through and voltage across the relay were taken to show the effects of the different loading devices on wave shape.

It is seen by examination of these tables that in nearly every case resistance loading gives the shorter time interval, the error varying from 0 to 30 per cent depending on the type of loading, percentage load and type of relay, the greatest difference being on the standard type CO relay between resistance loading and

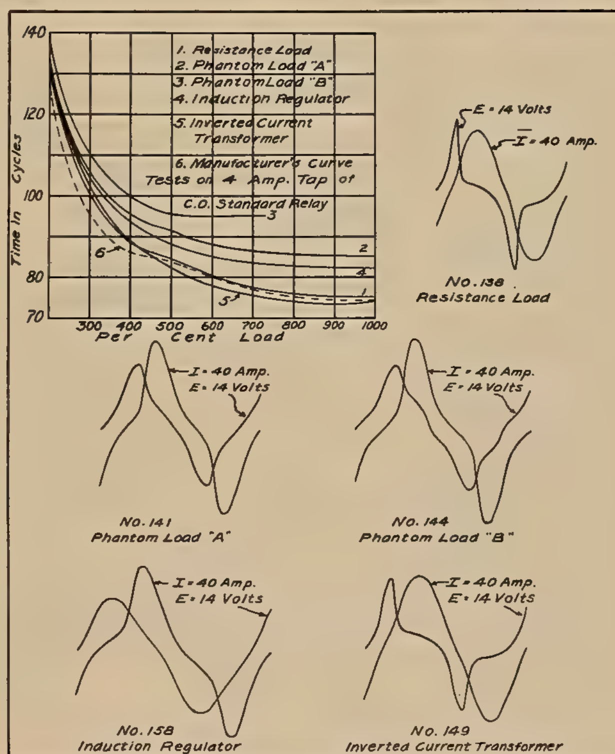

Fig. 5

phantom load "B" at 1,000 per cent in which case it amounts to 30 per cent. The difference in time at 200 per cent load between the above methods of loading was only 8 per cent. Phantom load "A" gave results about half-way between these extremes. Results obtained by using the inductive regulator were closer to the results as obtained by resistance than those obtained by use of either phantom loads. The least affected relay was the type CO, low-energy relay, which shows very little difference in time-current characteristics between resistance load and that obtained from phantom load "A," but shows a maximum difference of about 5 per cent between the resistance load and the phantom load "B."

The General Electric type IA-101 relay is affected slightly more than the low-energy type CO, so far as

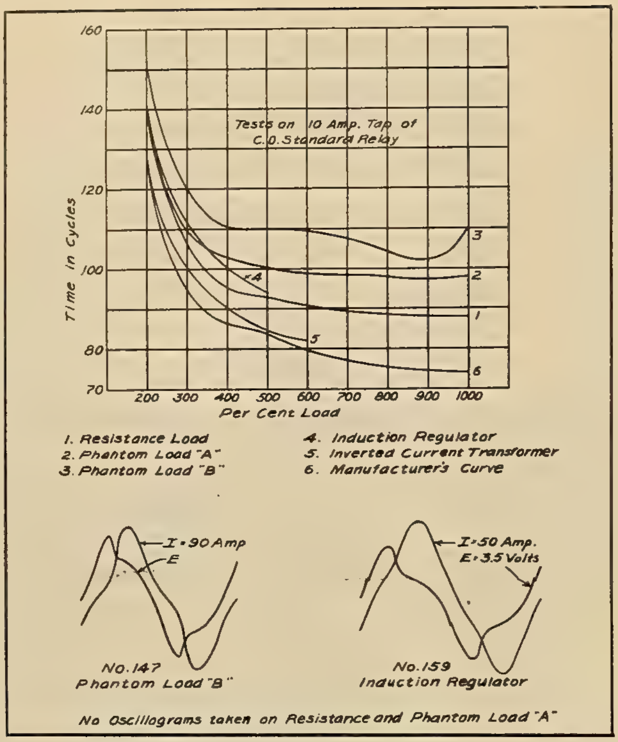

Fig. 6

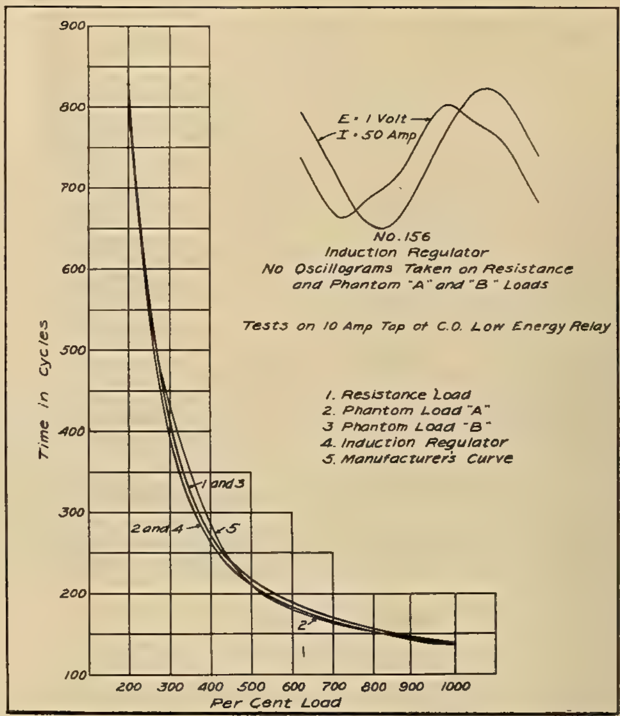

Fig. 8

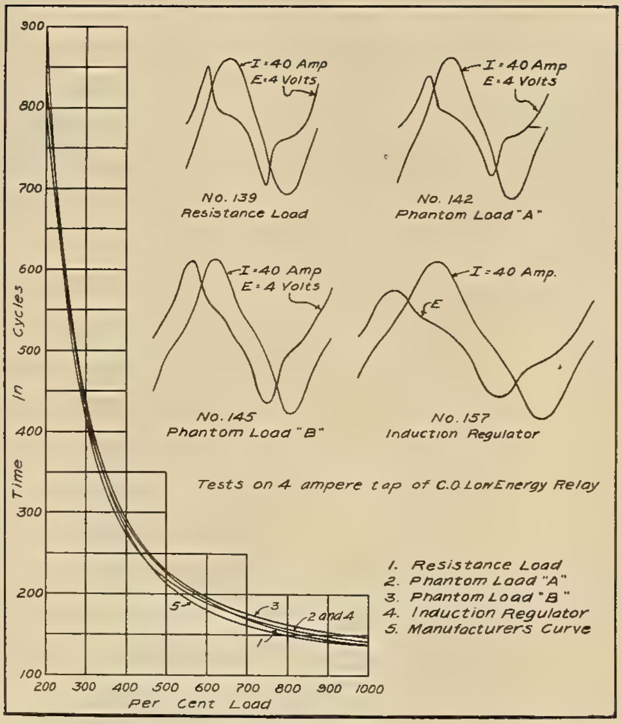

Fig. 7

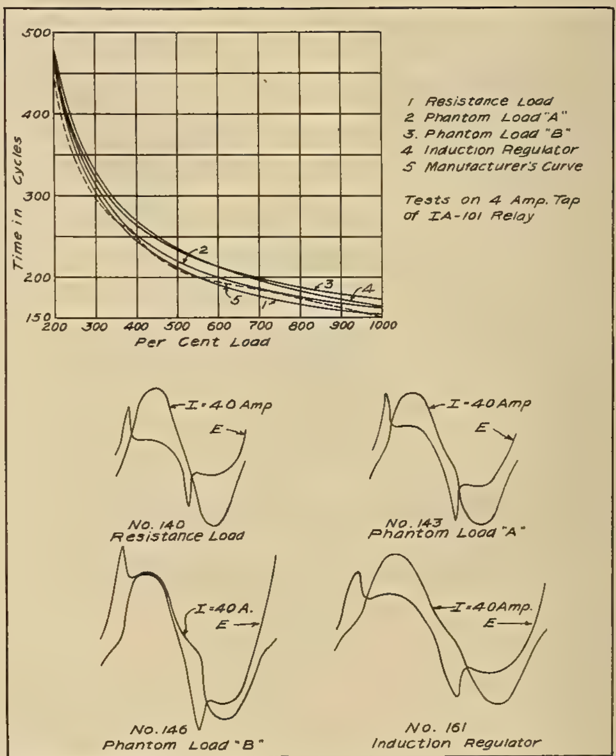

Fig. 9

differences in time caused by different methods of loading for purposes of calibration are concerned. The large discrepancy between the curve as supplied by the manufacturer and that obtained on resistance load in this relay was caused by a change of position of the relay contacts by ourselves, and it should not be assumed that this relay left the factory in that condition.

The oscillograms all show that with resistance loading the current in the relay is a sine curve, as would be expected. The voltage across the relay is distorted by the saturation of the iron parts of the relay. This saturation is necessary in order to make the relay come to a final definite time.

When loading a relay by resistance connected across 110 volts or higher, the drop in voltage across the relay is small compared to the total so that the distortion of supply voltage due to the relay coils is small, and as a result, the current through the relay and resistance combined is very nearly sinusoidal. When, however, the drop across the relay is a large percentage of the total impressed voltage, as it is when using a low voltage transformer, the E.M.F. of the circuit is no longer a sine wave, but is distorted by the saturated iron of the relay magnetic circuit which in turn causes a distorted current wave.

Since magnetic flux is directly dependent on the current the flux is correspondingly distorted, causing a decrease of torque on the disc.

An ammeter connected in series with the relay reads effective amperes, or square root of the mean square of the wave. The square root of the mean squares for the peaked wave may be equal to the square root of the mean square of the sine wave, and thus read the same on the ammeter, but their reactions on the current in-

duced in the rotating disc (torque) may be quite different.

This current distortion is increased by using resistance control in the primary of the loading transformer, since in this case the exciting current of the transformer is influenced by the resistance and the secondary voltage can not be sinusoidal. This further distorts the current in the relay, as is shown by the oscillograms as taken on the relays when loaded by phantom load "B."

From these tests we believe it is conclusively shown that apparatus used for relay calibration should be of such a nature as to give a sine wave current in the relay when it is connected in the circuit for calibration, in order that consistent calibration may be obtained.

As to the shape of the current wave passing through the relay at the time of tripping in service, that is problematic and a question open for discussion.

In making the above tests it was found that the relays became very hot during the course of the test. It therefore was thought that the effect of temperature should be investigated. Numerous tests were made on several relays at extreme temperatures. It was found that a hot relay was slower than a cold one, the error being rather large.

The above results thus may have some temperature errors, as no effort was made to correct them. As all the tests on any one relay were made on different days and in the same manner regarding starting at 200 per cent load and increasing the load to 1,000 per cent, the results should be comparable as the temperature at any particular load on any particular relay would be about the same.

Safety Rules

Report of Safety Rules Bureau, Technical Section*

THERE were three meetings held during the year, the first at Los Angeles, Sept. 19, 1924, the second at San Francisco, Jan. 9, 1925, and the final meeting March 27, 1925, at Fresno.

At the first meeting it was decided to put forth every effort possible to assist those in charge of the printing and revision of the State Safety Code. By appointing Mr. Kimball as a member of our bureau, we were enabled to keep in close touch with the work being done, and are pleased to state that the Electrical Safety Orders are now being published in tentative form and will be distributed as soon as possible after the public hearings, held May 12 and 19.

The subject of test facilities and industrial switches was given considerable time and thought, a report being submitted by R. H. Cates. It was agreed that the installation of test devices on light and power installations, to permit testing service meters and motors on consumers' premises without undue hazard to the tester was made necessary with the adoption of the state Safety Code, as all electrical wiring and control apparatus is required to be totally enclosed in metal conduits, cabinets, or race ways, all of which are required to be permanently grounded.

The manufacturers cooperated with the bureau in every way possible and submitted a large number of various types of switches and test facilities for the approval of the members, and by attending the meeting, the manufacturers' representatives were enabled to become familiar with the desires of those interested in this subject.

Before the first meeting of the bureau it was suggested by some of the members of the commercial section of the P.C.E.A. that the subject of electric range and heater installations be taken up with the idea of arriving at some suggestion as to changes to be made in the National Electric Code whereby the expense of electric range and heater installations could be reduced without materially reducing the safety features. J. M. Buswell carried on an investigation and submitted a final report at the Fresno meeting. While space will not permit of publishing the report, a number of suggestions were made which is of interest to all concerned. Parts of the code involved seem to be as follows: Article 16, Section 1602-C and 1602-D. Article 8, Section 811. There may be other sections where changes should be made but these are the principal ones.

The report gives full details as to recommendations and it is suggested that it be presented for approval by the Technical Section and forwarded as follows: A—To the Commercial Section, P.C.E.A., as a response to that section's request for a report on the subject. B—By the Technical Section Executive Committee to the National Electric Light Association, Industrial Accident Commission of California, the California Association of Electrical Inspectors and the commercial managers of member companies of the association. This should be done in an effort to bring about the suggested modifications.

In a report submitted by E. J. Crawford, a member of this bureau, at a meeting held in San Francisco by the Association of Electrical Inspectors, it was stated that Mr. Mitchell gave an outline of a number of changes which will appear in the 1925 Code. However, it was not stated what the changes were or that they have any connection with the above subject.

Because the National Electrical Code is in process of revision and the Electrical Safety Orders practically ready for public hearing, the subject of grounding circuits on consumers' installations was considered and the report was submitted by N. B. Hinson. Some very interesting results were obtained by tests made with the use of conduit for grounding purposes. This is being carried out by the Southern California Edison Company.

From the study of results obtained it is seen that the conduit is a better ground conductor than the copper wire and that the worst condition is the one required by the Code and ordinarily used, that is No. 8 insulated wire in ½-in. conduit with the wire carrying all the current.

It was also noted that in case of very heavy ground current the value at which the conduit would be destroyed by heating due to the current is several times that required to fuse copper. Approximately 475 amp. will fuse the No. 8 copper, while 1,500 amp. applied for fifteen minutes raised ½-in. conduit to red heat but did not damage it.

At the suggestion of the bureau there was appointed from each power company in California a representative as a member of the California Association of Electrical Inspectors, thus giving the association the support of the utilities and at the same time keeping in touch with changes of rules, etc., which may be proposed from time to time.

The following subjects were proposed for the work of the Safety Rules Bureau for the ensuing year: A—Safety orders application of, (keeping in mind that of providing test facilities). B—National Electric Code—to secure copies of tentative changes and outline suggested changes, tying in with the state Association of Inspectors through the representatives of this bureau who are members of that association. C—Grounding problems and requirements on consumers' installations. D—Safety switches, tying in with the meter committee of this section.

* W. H. Talbott, San Diego Consolidated Gas & Electric Company, chairman; J. E. Brown, Westinghouse Electric & Manufacturing Company; J. M. Buswell, San Joaquin Light & Power Corporation; R. H. Cates, Southern California Edison Company; E. N. D'Oyly, Western States Gas & Electric Company; W. R. Frampton, Southern California Edison Company; N. B. Hinson, Southern California Edison Company; J. A. Koontz, Jr., Great Western Power Company; S. J. Lisberger, Pacific Gas and Electric Company; H. H. Miller, Southern Sierras Power Company; E. R. Northmore, Los Angeles Gas & Electric Corporation; S. P. Russell, H. B. Squires Company; D. D. Smalley, Midland Counties Public Service Corporation.

Duct Line Temperature Measurement

By RAYMOND LEWELLING*

THE measurement of temperatures in underground conduits is being given considerable attention this year. The study of temperature conditions is necessary for determining the best economy of underground cable distribution practice.

A system of temperature measurement is being installed in a high-voltage conduit line by the Los Angeles Bureau of Power and Light, of which the following is a brief description:

By the use of a temperature bridge for measuring the resistance change in a unit length of No. 20 B&S gage copper wire accurately calibrated for temperature change, it is possible to study temperatures at remote

* Report of Underground Systems Bureau, Technical Section.

points in an underground conduit with a very high degree of accuracy. The distance from the instrument at which the temperature unit may be placed depends upon the uniformity in resistance of the two wires connecting

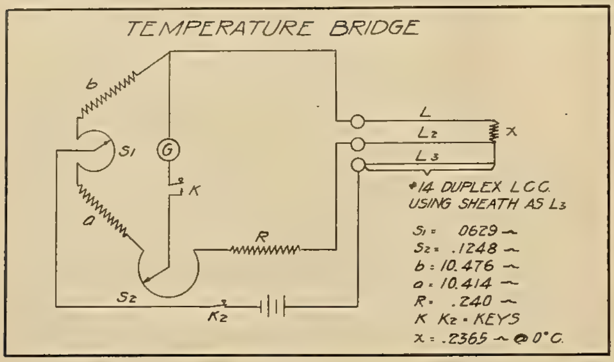

Fig. 1

the same. Using No. 14 B&S gage wire will allow of a distance of 50 ft. with an accuracy of within 1 deg. C.

For the study of temperatures in new conduit construction the temperature unit and wires are placed in the concrete of the conduit and become a part thereof (see Fig. 1) the ends of the wires being taken into a nearby manhole. The calibrated copper unit being very small, it is possible to place it under the lead covering

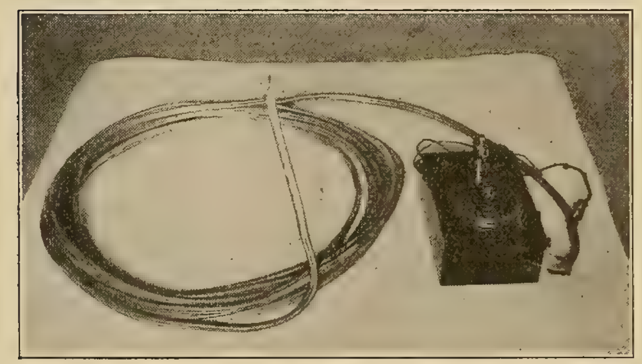

Fig. 2

of a No. 14 duplex cable (see Fig. 2), the lead covering serving as the battery lead or third wire for the bridge balance. This makes a very small unit which may be conveniently placed at any point in the conduit section and by the installation of several units in the cross section of the conduit (see Fig. 1), very good comparisons can be made for determining the heat flow.

The insertion of the unit in ducts of old conduits by using a flexible 3-conductor cord in place of the cable, will also prove valuable, though owing to the uncertainty of the contact so established, the temperatures read will not be so reliable.

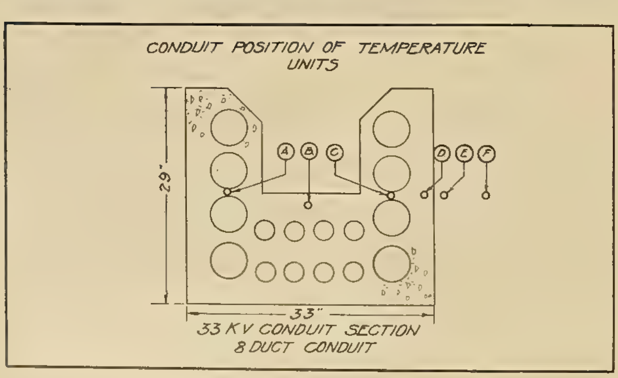

Fig. 3

When installing important heavy duty cables a temperature unit is wiped onto the lead sheath of the cable and installed with it, being pulled into the duct under lead seal as part of the power cable.

A measurement taken on all of the temperature units gives the temperature gradient in degrees centigrade from the cable sheath to a point one foot in the earth outside of the conduit section.

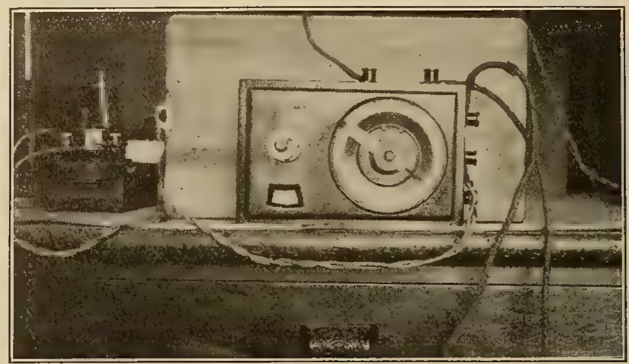

Fig. 4

Fig. 3 shows a diagram of the temperature bridge and the resistance values used. With slide wire S_2 at double the radius of S_1 it is possible to balance the bridge by turning but one dial which holds both sliders, and the pointer shows the temperature directly in degrees centigrade for each position (see Fig. 4).

Temperature measurements will be made at intervals of heavy load and during hot weather. Conduit temperatures and radiation characteristics can be determined and cable temperatures can be accurately known. Safe working temperatures for heavy duty cables can be determined and made use of in load dispatching. Conduit design can be adjusted to correct for poor heat flow within the conduit and to ground surface.

There are several elements entering into the solution of the duct line temperature problem, such as the type and spacing of the ducts, the dimensions of the envelope and its makeup and the moisture content of the soil and its heat carrying capacity. Tests of moisture content seem to vary from about 2 per cent to 18 per cent with an average of about 5 per cent for most soils in Coast cities.

Several of the Pacific Coast companies are making installations of experimental conduit lines with controlled loading and temperature indicators with various duct sections to obtain data on this problem.

Factors Governing Underground Construction

Report of Underground Systems Bureau, Technical Section*

SEVERAL of the Pacific Coast companies have standards which are prepared and used in ordering cable. These specifications cover the thickness of lead and insulation, loading, testing, inspection of the cable as manufactured, the furnishing of a certain percentage of the cable for testing, packing, and directions for shipping.

It is common practice for Coast companies to be rather liberal in the specifications and use of cable which is desirable for durability and operation.

There seems to be no common specification in use, yet for all practical purposes they are sufficiently close to render manufacturing features satisfactory. The larger companies purchase cable in such large quantities that

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a common standard specification is hardly necessary from a price standpoint.

It is the general opinion that cable should be purchased in sections such that the total reel weight should not exceed seven and one-half tons, and this weight only when extremely heavy section cable is to be handled. This is to reduce the possibility of the cable being bruised or the lead crystalized. Reels should be properly lagged, with a packing between the cable and the lagging as a cushion to protect the cable, and steel bands placed over the lagging, especially when packed for long distance shipment.

Manhole and Conduit Construction

These seems to be no common standard of manhole and vault construction, each company having its own standards. The increased density of loads which necessitate more and larger cables, transformers and equipment tends to require larger manholes and vaults.

The general design is quite uniform so far as wall thickness and strength are concerned. Both brick and concrete are used and with the exception of the roof are as a rule not reinforced. Used steel rails are in common use for roof reinforcing, due to their great strength and facility for installing and the placing of manhole castings. It is felt that in this matter we should not be too conservative for the reason that a single failure of manholes would be disastrous and far reaching in effect and probably would cause the enactment of more stringent laws governing the construction of them in public highways. More attention is being given to the design of manholes and vaults to facilitate the ease and security of cable racking. Conduit line entrances are properly recessed to permit of installing cable without sharp bending. More space is provided for installation of junction boxes and greater attention is given to obtain safe and adequate space for men working therein. Consideration is given to the matter of waterproofing of manholes and vaults. Some systems are arranged for connections to sewer while others are waterproofed and carefully sealed to exclude water, in which case forced ventilating systems are usually installed especially in transformer vaults to provide air circulation and low temperature conditions.

To date fibre has been in general use for conduit construction on the Pacific Coast. There is a tendency to increase the diameter of the duct to permit of installing larger cable—3½-in. and 4-in. ducts being in nearly exclusive present day use. The number of ducts, form of the conduit section, and the duct separation are given considerable thought. Several Coast companies are experimenting with concrete duct. Some difficulty is experienced due to the roughness of the inner surface, yet this handicap is expected to be overcome. The heat conducting quality of concrete duct is quite pronounced over that of fibre or pump log, which in itself is an important factor.

High-Voltage Cables—35 kv. and Higher

This subject is given considerable study. The use of high-voltage cable is rapidly coming into extensive use because of the constantly increasing density of loads and necessity for serving them through territory where overhead lines are not practicable or permissible.

Foreign and American cable manufacturers are rapidly improving the art of cable making, and have recently made single conductor paper insulated lead cable which is satisfactorily undergoing tests at 135-kv. potential between phases. This cable seems to differ from the earlier cable principally in that it is composed of graded paper insulation and impregnated with light oil compound. Paper of relative high dielectric strength is placed near the conductor and with gradually decreasing strength toward the outside. The high dielectric strength paper offers considerable difficulty for proper impregnation. A hollow core cable is used to facilitate impregnation. The compound is applied through the core, thereby obtaining the greatest dielectric strength near the conductor. Freedom from voids in the insulation and formation of occluded spaces is eliminated. Conservators or chambers for holding quantities of compound are attached to the joints and potheads to insure the cable remaining constantly full even though the lead sheath undergoes deformation.

Quite a considerable amount of 35-kv. triplex cable is in satisfactory operation on the Pacific Coast. It is paper insulated and impregnated with blended compound.

A recent 45-kv. cable installation by the Great Western Power Company is of distinct importance, it being an advance in the use of triplex high voltage. Each conductor is composed of one layer of 22-strand copper .0592-in. diameter each, with a total area of approximately 77,000 cir. mils surrounding a 13/32 in. hemp center.

The installation is saturate paper 13/32 x 6/32 in. all of 5 mill thickness.

The sheath is 1/8 in. lead covered with two layers of reinforced rubber, each layer being .033 in. thick. A jute bed is placed on the rubber and over all a No. 3 B.W.G. steel wire armor is applied.

The cable is tested at 90,000 volts between conductors for five minutes and at 55,000 volts between conductors and sheath for five minutes.

This cable is being installed across Napa Creek, north of San Francisco Bay, with 30-ft. pole risers at each end and without splices.

It is equipped with terminals of the three-conductor flat outdoor-type potheads with adjacent bushings on 36-in. centers. The body of the pothead is made of sheet steel. Both cable and potheads are American manufacture.

This cable is connected as a link in an overhead line operated at 45,000 volts. At this date the cable has not been placed in service. Its operating performance will be of considerable interest.

Revision of the National Electrical Safety Code—Sec. 29

Consideration was given to the draft of the proposed revision of the National Electrical Safety Code as submitted by the N.E.L.A. The larger part of the section was found to be good practice and satisfactory except where specific dimensions are provided, which are generally more conservative than the California state law requirements.

Rcommendations

The committee recommends the following points of interest to be followed for the next year's investigation and discussion:

1. Improved design in outdoor and indoor cable terminals.
2. Study of the Kenetron testing set.
3. Metal conduits as used for underground laterals, particularly as to the treatment of these conduits in order to lengthen their life in the ground.
4. High-voltage underground cables.
5. Cement duct.
6. Junction boxes.

Cable-Splicing Instruction

By PAUL E. CHAPMAN*

ONE member company has recently been confronted with the problem of securing good cable splicers for the joining and splicing of underground lead covered cables. The art of cable splicing has not been practiced by many men, and it has been impossible to secure good artisans in this line.

In order to meet the situation a cable splicing school was started, wherein men could be educated in the art of cable splicing and in the installation of underground structures which go with cable work. The first class of men, approximately twenty, has most of its members working at the present time as cable splicers and cable splicer apprentices. It has been found possible to educate these men during a period of several weeks time so that they were able to do cold work satisfactorily.

The original school was carried on during the day time. This practice has now been changed and instruction is given two nights a week over a three months period two hours each night to a class of thirty-six men. Most of the men who have entered these classes are young and readily apply themselves to the carrying out of the instructions given them by their teachers. The results have been very satisfactory. There will be enough men instructed in the art of cable splicing so that hereafter the company will not have to meet the problem of incompetent men in order to cope with a cable splicing emergency.

* Report of Underground Systems Bureau, Technical Section.

Evening instruction is divided into a one-hour lecture and one-hour actual work. Some of the evening periods are given entirely to a two-hour working period by the student, as it requires practically that time to prepare his metal and wipe a large joint. The men are all dressed alike. They observe absolute discipline in the class room, are prompt in their attendance and neat and efficient in the work they do. It is absolutely necessary that strict discipline, alertness and neatness be observed by the students in order that they may be on confusion and no unnecessary delay in putting on the evening's work.

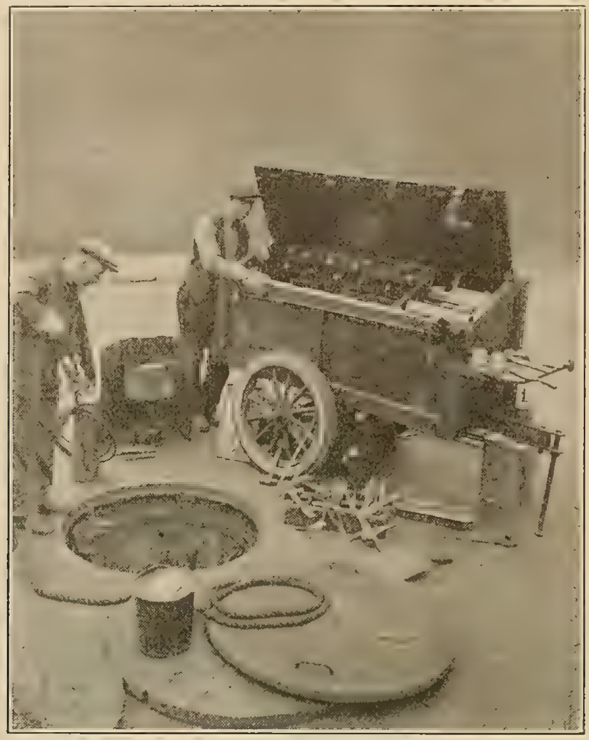

Fig. 1

The men furnish their own uniforms and small hand tools. The company furnishes all the necessary instruction, material and larger tools. Elementary electricity and the fundamentals governing the art of cable splicing, box work, installation of transformers and cable fault finding are given the men in the lecture period. The actual work consists of low voltage and high voltage lead cable splicing, junction box work, installation and connecting of underground transformers, the installation of inside and outside potheads and terminals.

Cable Splicers' Manual

In conjunction with the cable splicing school it was found necessary to have a text book for instruction purposes, this book of such nature that the student could readily understand the subjects presented. On looking over the various texts published, nothing was found which covered cable splicing in a comprehensive and practical way. It was decided therefore to draw up a manual covering the art of cable splicing as practiced by the company holding the school. The material as presented consists first of a preface covering school organization and the conduct of the student in the class room, followed by an outline of cable splicing, the subjects covered and the tools and materials used. A chapter is devoted to the location where cable splices are made and why they are made, also a chapter is given on electrical generation and distribution, together with a number of diagrams showing the distribution system for the various classes of current and voltage. The construction of cables, the material which enters the construction from the copper conductor to the ultimate lead covering, is briefly described, also a small amount of text given to the explanation of submarine cables. The balance and main part of the text is devoted to the installation of lead covered cables in duct lines, and the splicing or joining of these cables. The various styles of boxes, cut-outs, oil switches and subway transformers are well explained, both in the text and by diagram. The final chapter in the text is given to safety rules as applied to underground work. It is felt that this manual will be a great aid in the education of cable splicers.

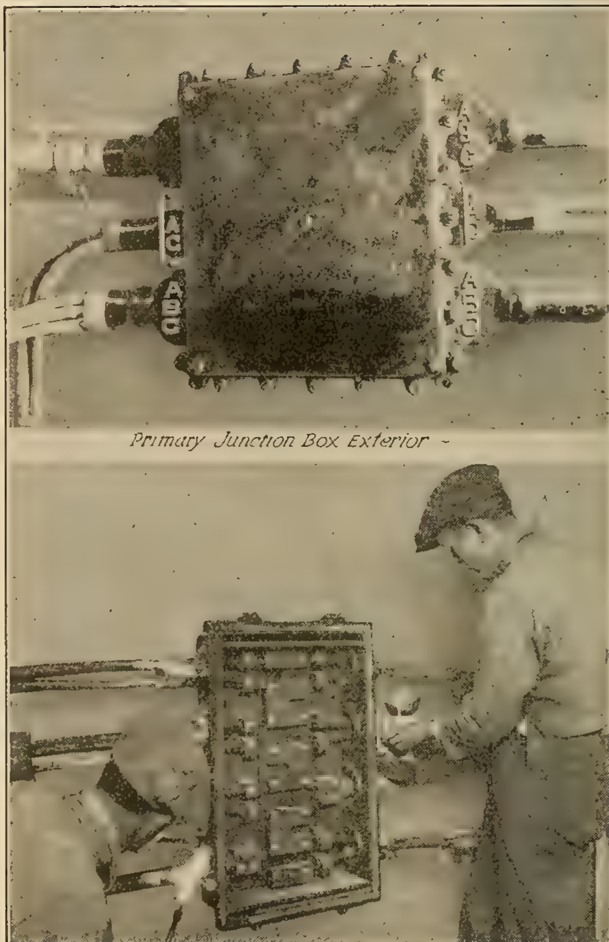

Fig. 2

The first manuals issued can be improved. As soon as they are used and their various discrepancies noted the book will be revised and re-issued. The object was to obtain as near as possible a manual of cable splicing that would cover the field in a practical way, the text so worded and the diagrams so drawn that the average man who follows this class of work could readily understand it. The text and diagrams, together with such photographs that are used, are neatly bound together and enclosed within a serviceable cardboard cover.

Figs. 1 and 2 show typical photographs contained in the manual.

New Developments in Design, Application and Operation of Electrical Operation

Report of Apparatus Bureau, Technical Section*

THE apparatus bureau of the Pacific Coast Electrical Association has endeavored this year to keep in touch with the new developments and applications of such electrical apparatus as are of special interest and benefit not only to the members of the Bureau but to the various member companies whose employees are associated in this work. Electrical apparatus covers such a wide and varied field that it can not be fully covered each year. However, there are many studies which can be made and reported upon to the benefit of all. In addition there is the work of keeping in touch with new developments.

So closely is the study of electrical equipment associated with the story of its functioning that it is necessary carefully to consider the operating problems involved and to exchange operating practices and experiences. The apparatus bureau in its program and its meetings has endeavored to be a clearing-house for such information as is of value to its members.

Organization

The organization of the apparatus bureau this year is on the company correspondent plan. The bureau chairman selected one representative from each member company, who in turn selected his assistants from his company and assigned to them certain parts of the program of study for which to be responsible. This plan very materially saved in the matter of correspondence for the bureau chairman and resulted in the selection of more interested and better qualified men than if selected at a distance by the bureau chairman.

The company correspondents and the company members have been urged that where possible they endeavor to hold meetings of their company representatives to discuss the work in hand so that all will become familiar with the various phases of the different problems.

There has been a ready response from the men selected as company correspondents and from the members selected by them. The personnel of this committee as shown by the accompanying list is rather large, but it is mostly due to the members selected by the company correspondents as assistants. The work of the apparatus bureau covers such a wide field that it is necessary to have a great variety of talent to accomlish the desired results. There has been an effort to interest new members in the work to replace the older members who for one cause or another now find their time taken up with other duties and can not give the time they otherwise would like to give to the work of the bureau.

This work is also a study of the every-day problems of each member and by a wide exchange of ideas all are helped in the performance of their daily tasks. A large and interested membership together with live and interesting topics gives the greatest good to all and to the companies represented.

Program and Meetings

Three meetings of the apparatus bureau have been held, all in conjunction with the meetings of the Technical Section.

The first of these meetings was held in Los Angeles on Sept. 18, 1924. There was an attendance of sixty and at this time was discussed the program of the year. There were many interesting discussions and suggestions. This program is outlined as follows:

- Oil Circuit Breakers
  - Progress in higher voltage circuit breakers
  - Progress in increasing rupturing capacity
    - By additions to existing breakers
    - By increase in speed of break
    - By increase in number of breaks per phase
  - Rating of breakers—particularly those manufactured on the Pacific Coast
  - In this connection it is desired that power line tests be arranged if possible through approval of system executives
  - Operating experiences
    - Such experiences would be of particular interest as regards rating of breakers if these can be checked up with system calculating boards.
  - Use of transformer oil as a substitute oil
  - Progress in the methods of interlock between oil circuit breakers and disconnect switches
  - Miscellaneous
- Transformers
  - Polarity
    - Additive vs. subtractive polarity standard for distribution transformers
    - Questions should be settled more definitely and Pacific Coast companies present unified opinion
  - Voltages
    - Grouping of standard taps of transformers
    - Relative satisfaction for both station and distribution sizes.
  - New design
    - Application of new ideas to existing equipment
  - Cooling
    - Automobile type radiators
    - Results after long period of service should yield information
- Power interchange
  - Preeminence of Pacific Coast in this field
  - Problems of various frequencies and voltages
  - Discussion of wide interest
- Frequency changers
  - Applications to various systems should be studied
  - Experiences of users of interest and value
- Voltage control
  - By means of tap changers operated under load conditions
    - Automatic
    - Manually operated
  - Booster or crusher transformers for proper voltage conditions
- Relays and relay applications
  - New types of relays for transmission network protection
  - New types of relays for protection of equipment from internal trouble
  - New or unusual applications of older types of relays
  - System calculating boards
    - Value in obtaining proper relay settings
    - Value in selection of adequate breaker equipment
  - Miscellaneous

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* Chairman: C. E. Schnell, San Joaquin Light & Power Corporation. Members-at-large: R. H. Halpenny, Southern Sierras Power Company; S. J. Lisberger, Pacific Gas and Electric Company; L. J. Moore, San Joaquin Light & Power Corporation; E. R. Stauffacher, Southern California Edison Company. Company correspondents and members: Los Angeles Bureau of Power and Light—J. C. Alberts, H. H. Cox, C. P. Garman, Roy Martindale, O. W. Wingard; The California Oregon Power Company—R. S. Daniels, H. G. Getchel, Harvey Gilman, O. G. Steele; City of San Francisco—Paul J. Ost; Coast Counties Gas & Electric Company—A. E. Strong, W. R. Van Bokkelen; Coast Valleys Gas & Electric Company—G. A. Peers, T. W. Snell; Garland-Affolter Company—G. E. Armstrong, P. H. Affolter; General Electric Company—J. H. Cunningham, H. E. Fuqua, W. E. Melarkey, W. C. North, H. C. Stanley, W. C. Smith; Great Western Power Company—C. F. Benham, G. H. Hagar, D. G. Kramer, G. K. Morrison, J. H. Paget; C. E. Ingalls, Manufacturers' Agent—C. E. Ingalls; Los Angeles Gas & Electric Corporation—F. E. Dellinger, F. R. Knight, G. A. Riley; Ontario Power Company—A. J. Hall; Pacific Gas and Electric Company—E. A. Crellin, B. D. Dexter, R. B. Kellogg, H. S. Lane, H. A. Laidlaw, H. T. Sutcliffe, R. W. Wilkins; San Diego Consolidated Gas & Electric Company—K. B. Ayres, A. S. Glasgow, E. D. Sherwin, C. W. Wiggins; San Joaquin Light & Power Corporation—R. C. Denny, R. D. Likely, H. H. Minor, H. S. Minor; Southern California Edison Company—L. L. Dyer, J. C. Gaylord, D. J. Kennelly, C. C. Long, F. H. Mayer, H. L. Sampson; The Southern Sierras Power Company—M. L. Baden, M. E. Jones, P. H. Yelton; H. B. Squires Company—S. P. Russell, R. P. Snoke; Westinghouse Electric & Manufacturing Company—J. E. Bridges, A. W. Copley, P. B. Garrett, W. P. L'Hommedieu, R. C. Stackhouse.

Automatic generating plants and substations
- Subject of continued interest due to new applications and installations
- Experiences should be discussed as often as possible
- Operating costs data most important

Compilation of joint reports
- With hydraulic power bureau on existing hydro-electric stations
  - Apparatus bueau to supply available information on electrical equipment
- With prime movers bureau on existing steam plants
  - Apparatus bureau to supply available information on electrical equipment

Station electrical grounds and control of grounds
- Further discussion desired
- Standard methods of preparing electrical grounds is objective
- Methods of determining value of ground resistance

Fire-fighting equipment.
- Study of means used to extinguish fires of different natures
  - Generators
  - Transformers
  - Cell compartments

Other topics were discussed the study of which it was believed would be of value to the bureau, but owing to the length of the program it was decided to omit them as definite parts of the program. Topics omitted were:

- Power factor correction
- Lightning arresters.
- High tension fuses

Study of these subjects might well be made in the future as there are continual developments along each of these lines. Radio interference from power lines was discussed and while considered important, was believed to be logically a topic for the inductive coordination bureau to study.

The second meeting of the year was held in San Francisco, Jan. 8, and 9, 1925, in conjunction with the other bureaus of the Technical Section. Attendance at this meeting was forty-five and the discussion was devoted to the program as outlined at the Los Angeles meeting.

The third meeting was held in Fresno, March 26 and 27, 1925, also in conjunction with the various bureaus of the Technical Section. Attendance again was forty-five and discussion was devoted to further consideration of the program and to the report submitted for the year. Inasmuch as this was the final meeting of the year for the bureau on account of there being no Pacific Coast Convention, efforts were made to close up the work insofar as possible and to suggest such topics as might be desirable for future study.

The really important points of these meetings will be reviewed later on in this report under their respective headings.

Cooperation with Electrical Apparatus Committee, Technical Section, N. E. L. A.

There is a very earnest desire on the part of the apparatus bureau, P. C. E. A., to work in close conjunction and harmony with the national electrical apparatus committee. It is the belief of the chairman that there has been much good accomplished.

The program of this bureau, although formulated before the program of the national committee was made public, comes into very close contact with the latter in a number of important subjects. Particularly in the subjects of oil circuit breakers and protective equipment, a.c. substations, transformers and regulators, hazards and safety and system connection schemes. Certain of the sub-topics of this bureau's program have been suggested for study by certain subcommittees of the national electrical apparatus committee through A. A. Meyer, the chairman, and this bureau well may feel proud that its efforts are recognized outside of the local field.

In the matter of close cooperation with the national committee there have been many questionnaires sent out which have been freely answered. Answers have been forwarded to the various national subcommittee chairmen.

These questionnaires have been as follows:

(A) Subcommittee on Transformers and Regulators
- (1) Fire protection
- (2) Temperature indicators for distribution transformers
- (3) Prevention of congealing of oil in conservative piping
- (4) Practices regarding oil storage tanks
- (5) Manufacturers' methods used in checking quality of oil
- (6) Effects on transformers of short circuits with sustained primary voltage.
- (7) Transformer and regulator tap changers.

(B) Subcommittee on Oil Circuit Breakers and Protective Equipment
- (1) Operating duty for automatic reclosing oil circuit breakers

(C) Subcommittee on a.c. Substations
- (1) Grounding practices
- (2) Standard symbols for substation wiring diagrams
- (3) Interlocks between oil circuit breakers and disconnect switches

(D) Subcommittee on Operating Methods, Routine and Facilities [This is a new committee with a very interesting program which is taking up only two subjects this year and on which questionnaires have been sent out as follows:]
- (1) Switching and grounding
- (2) Inspection and maintenance of apparatus and equipment.

(E) Subcommittee on Hazards and Safety
- (1) Fire-fighting equipment for oil-filled apparatus
- (2) Troubles with certain types of foam extinguishers

(F) System Connection Schemes Subcommittee
- (1) Transmission lines
- (2) Distribution lines (including a.c. low-voltage net works)
- (3) Station buses and bus connections of lines and equipment
- (4) Operating practice.

One of the fine efforts toward closer cooperation between the national committee and the divisional committees has been the exchange between th divisional committees of minutes of past meetings. Many points of interest in local study are discussed and reported upon in these divisional committee minutes and these have been called to the attention of this bureau to advantage. After each of the local meetings the minutes have been sent to the national electrical apparatus committee chairman, and to each chairman of the divisional committee, this being in addition to the copies of minutes distributed with the local bureau organization.

The apparatus bureau has been particularly fortunate in being represented at two meetings of the national electrical apparatus committee this year. J. C. Gaylord of the Southern California Edison Company, Los Angeles, attended the St. Louis meeting Oct. 20 and 21, 1924, and carried to the national committee a message of our efforts on the Pacific Coast. A fine report of the meeting was brought back. The bureau chairman attended the national committee meetings in Cleveland Feb. 4 and 5, 1925, and endeavored to uphold the Pacific Coast before the national committee by telling of Pacific Coast work and effort and by taking part in the discussion. Such contacts not only greatly help the members fortunate enough to attend these meetings but also help the membership of this bureau through the closer contacts which afterwards are maintained.

Oil-Circuit Breakers

Requirements as regards rupturing capacity of oil-circuit breakers on a system has increased with each addition to plant or transmission line capacity and with each interconnection with other systems. Voltage of transmission lines has increased steadily so that oil-circuit breakers now are one of the most expensive parts of a station equipment. With the great desire on the part of power companies to guarantee continuity of service, there are built duplicate transmission lines each of which adds to the problem of circuit breaker operation and cost.

This committee is interested in the story of what the various manufacturers are doing to meet this ever-increasing demand and also is interested in knowing how the problems are being met by the operating companies themselves whenever the point is reached that their existing circuit breakers are too small, hence the outline in our program:

- (1) Progress in higher voltage breakers
- (2) Progress in increasing rupturing capacity
  - (a) By additions to existing breakers
  - (b) By increase in speed of break
  - (c) By increase in number of breakers per phase

Among the manufacturers there seem to be two divisions of opinion and switch design governing the direction of their efforts. One of these is the double-break switch with explosion chambers, relief vents and a comparatively small volume of oil. The other is the

multi-break switch with a much larger volume of oil. The multi-break switch is now being made with up to ten breaks per phase. Both types of breakers have been used by member companies with excellent results.

The following papers have been submitted, and appear in full later in this report:

"Increasing Oil-Circuit Breaker Interrupting Capacity," by H. H. Cox; "Oil-Circuit Breaker Experiences and Problems," by H. S. Minor; "Results of Tests on Oil-Circuit Breakers of Pacific Coast Manufacture;" "Interrupting Capacity of Oil-Circuit Breakers Manufactured on the Pacific Coast," by C. C. Long and L. L. Dyer; "Short Circuit Tests on Kelman Type Y15 Oil-Circuit Breakers," by C. C. Long and L. L. Dyer; "High-Tension Oil-Circuit Breakers," by R. W. Wilkins, B. D. Dexter and H. T. Sutcliffe; and "Short Circuit Duty on Kelman Switches at Laguna Bell Station," by E. R. Stauffacher.

There should be impressed upon them and also upon the operating men the fact that the power companies are groping in the dark and that the gamble is on the shoulders of the power companies if they continue to purchase oil-circuit breakers as they would not purchase any other equipment.

Through the interest and efforts of L. J. Moore of the San Joaquin Light & Power Corporation and J. P. Jollyman of the Pacific Gas and Electric Company it is possible that certain tests may be made on high-voltage breakers this fall. The information from such tests should be valuable to both operating men and manufacturers. It is the hope of this committee that there will be continued efforts along the line of oil-circuit breaker tests and that the information gained will be given to this committee. Certain oil-circuit breaker manufacturers have offered complete cooperation in these tests.

In order that much information might be gained from operating experiences with oil-circuit breakers, a subcommittee was appointed to study the subject and devise a standard form for use in order that infromation gathered from oil-circuit breaker inspection might be uniform. In this way the operation of similar oil-circuit breakers on different systems may be compared. The membership of this committee is as follows:

J. C. Gaylord, chairman; Southern California Edison Company.
C. F. Benham, Great Western Power Company.
H. A. Laidlaw, Pacific Gas and Electric Company.
R. C. Denny, San Joaquin Light & Power Corporation.
H. H. Cox, Los Angeles Bureau of Power and Light.

The form agreed upon is shown in Fig. 1 and it is the recommendation of the subcommittee that it be used by the operating departments of the various companies for oil-circuit breaker inspection reports.

OIL SWITCH OPERATING RECORD

Operating Company ________ Date ________ Time A.M. ________ Time P.M. ________

Switch Location ________ Number or Company Designation ________

Manufacturer's Name ________ No. ________ Type Switch Automatic ________ Non-auto ________ No. Breaks ________ Type of oil used ________

Voltage ________ Rated Cur. Capacity Carrying ________ Rupturing ________

No. of automatic openings since last overhaul ________

Nature of overload Ground ________ Single Phase ________ Three Phase ________ Approx.Cur. Interrupted ________

Findings:

		Phase A	Phase B	Phase C
General External Conditions.	(Bushings broken or cracked,			
	(Switch top broken or cracked,			
	(Tanks bulged or split,			
	(Oil spillage or leakage,			
Internal Conditions	(Bushings			
	(Blades			
	(Contacts			
	(Oil (Dirty wet or carbonized)			

Was opening satisfactory ________

Fig. 1—Suggested form for oil-switch operating record. The use of this record form by all member companies will supply useful information for the further consideration of the apparatus bureau.

It is safe to say that practically all substations built more than five years ago are loaded up to or above their capacity and are obsolete in design at the present time. The circuits which they were resigned to feed also are, in general, overloaded and obsolete in design so that in many cases they require more attention as to voltage regulation than good modern practice would justify. Aside from the actual loading of transformers, regulators and other substation equipment, the oil-circut breaker situation is the most acute. As system capacities have increased possible short circuits have increased rapidly. Comparatively few of the circuit breakers originally installed in different substations are capable of interrupting the maximum short circuits to which they might be subjected today.

Much attention has been given to the best method of meeting this situation. Realignment of system connections, including sectionalizing of transmission lines and substation buses, has given relief in some cases. In other cases it has been necessary to accompany the sectionalizing by making the circuit breakers non-automatic. Again, in some instances reactors have been installed to give the necessary relief to the circuit breakers.

However, the requirements of oil-circuit breakers are becoming more definitely known each day. This is not only from past experience, but also by reason of the fact that many companies now are equipped with system test or calculating boards whereby each problem can be set up and the answer made known. Knowing that and also with a foresight into the probable system growth, it becomes increasingly more difficult to reconcile our definite requirements to the purchase of equipment of which only part of the characteristics are known. Only the fact that there is some margin in price at all reconciles this lack of knowledge. Price becomes increasingly less important as the loss in case of shut-down due to faulty switch operation mounts up. Manufacturers should endeavor to establish definite ratings for their switches.

Suggested Standard Interrupting Ratings for Oil-Circuit Breakers

The electrical apparatus committee, Technical National Section, N.E.L.A., through its subcommittee on oil-circuit breakers is planning to ask the manufacturers of oil-circuit breakers to standardize upon oil-circuit breakers of the following interrupting rating:

25,000 kva.	250,000 kva.
50,000 kva.	500,000 kva.
75,000 kva.	1,000,000 kva.
125,000 kva.	1,500,000 kva.

Use of Transformer Oil as a Substitute for Switch Oil

There has been considerable discussion as to the advantage of one oil for all oil immersed apparatus. Certain of the manufacturers of oil-circuit breakers have recommended the use of their transformer oil in oil-circuit breakers where the temperature does not go below 0 deg. C. Another company takes the stand that only switch oil as such should be used in circuit breakers.

As is the case in getting at the answer of an important problem, the men of the operating companies attack the problem in their own way and obtain the answer from their own experience. Many of the member companies of the P.C.E.A. are using transformer oil in oil-circuit breakers and are getting very excellent results. This statement applies to switches operating at 70 kv. and 120 kv. and whose duty is most severe.

Aside from the saving in cost of storing and handling only one oil over that of two oils, there is a very considerable saving in the cost per gallon of transformer oil over that of switch oil. In large switches this is a considerable amount.

It is the recommendation of the chairman that this topic be discussed often and that any failures of oil-circuit breakers due to the use of transformer oil be reported.

Progress in Methods of Interlock Between Oil-Circuit Breakers and Disconnect Switches

One of the most important factors of present-day central-station construction is the proper design and operation of adequate interlocking between oil-circuit breakers and disconnecting switches. Especially is this true in view of the larger concentration of power within single generating stations and large substations. There

has been designed and installed interlocking equipment to prevent the disconnecting switches being operated in proper sequence. These designs have been thoroughly tested out in actual practice. Of course it is understood that the views of operating companies in regard to interlocking do not always coincide, one company requiring more interlocking than another due primarily to the character of the operating force employed. The usual interlocking consists of a mechanical device to prevent opening the disconnecting switch unless the oil-breaker first has been opened and also to prevent the removal of the oil-circuit breaker or disconnecting switch-cell door (both doors usually combined in one) unless the oil breaker and disconnecting switch both are open. However, it oftentimes becomes necessary to operate the oil breaker with the disconnecting switches in the open position so that contact pressure and alignment can be checked. To accomplish this an additional interlock has been devised that will enable a single operator to disengage the regular interlocking arrangement and thus be able to operate the oil breaker with the disconnecting switches open. The design of this disengaging feature is such that one key is employed and this key is in possession of the particular operator whose duty it is to check the contact alignment, the purpose of this arrangement being that it will not be possible for the regular station attendants to either open or close the breaker while the contacts are being checked. This interlocking feature often is demanded as an additional safeguard along with the tagging of proper control switches as usually employed. All of the foregoing of course assumes that gang-operated disconnecting switches are used. That is three or six disconnecting-switch poles operated simultaneously from one handle lever. The normal scheme of interlocking, together with gang-operated disconnecting switches, can also be employed in a large number of station layouts.

Target indicating devices also have been used. However the success of the whole scheme of interlocking depends upon a very high grade of intelligence on the part of the operator and very careful checking of circuits before attempting to work upon them. No scheme of interlocking can be successful unless this is true.

Transformers

Polarity—The question of desirable polarity for distribution transformers, whether additive or subtractive should be standard throughout the range of distribution transformers, has been settled by the report of B. L. Jamison, chairman of the subcommittee on transformers and regulators, electrical apparatus committee, N.E.L.A. The report is as follows:

"In accordance with the subcommittee action at St. Louis on Oct. 20, 1924, I am sending you herewith copy of the summary of questionnaires circulated by the overhead systems and the electrical apparatus committees regarding the above topic. This is shown in Table I. This tabulation is sent you for your information as our subcommittee is not contemplating any action this year in this matter."

Voltages—The question of whether or not the grouping of standard taps of transformers is satisfactory for both station and distribution sizes is one which has been discussed but upon which no definite action was taken. One of the problems which presents itself to the member companies of the P.C.E.A. is outlined in a paper on "Distribution Transformer Ratios" submitted by H. H. Minor. This paper is printed in full later in this report.

The points raised in this paper are important enough for careful consideration especially in view of the fact that the electrical apparatus committee, N.E.L.A., has asked for a careful review of voltage ratings and ratios for transformers. Hence this bureau has decided to work in conjunction with the overhead systems bureau on this matter in order to present a joint recommendation as to pertinent needs.

A report from the Pacific Gas and Electric Company covering the "Relation of Various Distribution Transformer Primary Voltages" also appears in full later in this report.

New Departures in Transformer Design and Applications of New Ideas to Present Equipment

Under this topic there has been a consistent effort on the part of the manufacturers to provide thermometers and temperature-indicating devices of greater accuracy and reliability that the maximum capacity of transformers may be utilized. With such devices less attention may be paid to the rated ampere capacity of the transformer and more attention given to its thermal capacity which is really the limiting feature.

TABLE I

	No. of transformers	Kva. capacity	Per cent of total
(1) In favor of **additive polarity** and will order additive irrespective of standard adopted....	229,634	3,024,158	50.0
(2) In favor of **additive polarity** and will order subtractive if adopted as standard..........	89,975	1,201,962	20.0
(3) Total in favor of additive polarity..........	319,609	4,235,120	70.0
(4) In favor of **subtractive polarity**............	64,299	1,305,344	21.6
(5) Indifferent................................	26,527	505,371	8.4
Total answering questionnaire.............	410,435	6,045,835	100.0

One of the newer types of transformer-load indicators is a device which may be applied to distribution transformers by lifting the cover and inserting the bulk of the device in the oil. Upon replacing the cover the indicating device is plainly visible and being of the dial type show an easily distinguished signal when safe load conditions have been exceeded. As well as showing overloaded transformers it also shows underloaded transformers. The really interesting part of this instrument is that it automatically corrects the reading of the indicating hand for variations in the ambient temperature. When transformers are loaded on the basis of oil temperature alone there is great danger of overheating and burning out the coils. With the instrument described the thermometer immersed in oil gives a reading based upon the actual oil temperature and this reading then is modified by the ambient thermometer in the instrument case in a way such that the reading of the hand on the dial is a positive indication of the percentage of safe load on the transformer. The ambient correction feature not only permits higher loading of the transformers in winter and in the evening when the surrounding air is cool, but also gives a warning when the load on the transformer reaches a dangerous point during the heat of summer or during the daytime under the direct rays of the sun.

Cooling of Transformers

An increasing demand from the power companies for larger sizes of self-cooled transformers has been made until now this type of transformer is manufactured in sizes up to 20,000-kva. units. In order to ship these large transformers with oil it is sometimes necessary or desirable to remove the radiators. To eliminate the necessity of withdrawing the oil when removing or replacing the radiators there has been developed by one manufacturing company a very compact type of poppet valve which is closed at such times enabling the radiator to be removed or replaced as desired. When open, this valve does not interfere with the circulation of the oil in the radiator and in no way lessens the cooling effect.

Another insight into this self-cooled transformer situation is had with the development of a new form of radiator by the Pittsburgh Transformer Company which reports as follows:

With the more extensive use of self-cooled, radiator-type transformers the problems involving weights, space for shipment and installation of radiators upon arrival at destination become more difficult.

Shipment of self-cooled, radiator-type transformers has in the past oft times necessitated the removal of the radiators before shipment from the factory in order to avoid damage to the radiator while in transit and to meet shipping space limitations. Such conditions necessitate assembling the radiators on the transformer after the shipment arrives at its destination. This entails additional expense, delay and annoyance in placing the transformers in operation. This condition is particularly true when large transformers requiring from fifteen to twenty radiators per transformer are involved.

When assembling radiators in the field it is more or less difficult to secure an oil-tight fit due to the difficulty in securing proper alignment of flange-bolt holes, gaskets, etc. Also there is danger that the openings on the radiators may not be properly protected thereby allowing moisture to enter the radiator. If this point is not carefully watched the moisture may not be en-

TABLE II.—Monthly summary of automatic switch operations, Southern California Edison Company.
JANUARY 1925
An analysis based upon the ideal operation of protective equipment
Trouble on 2,300-volt and 4,000-volt circuits
and equipment is neglected.

	Potentials in kv. 11	16	33	66	150 & 220	Total cases	Percent of total
Clearance of trouble							
1. Total number of cases possible to be cleared (Includes trouble which could be cleared by the operation of one or more automatic circuit breakers. Each case of trouble counts as one, regardless of the number of operations required to clear the trouble. If a switch is closed in for test and trips out this does not count as another case of trouble)	40	8	2	8	6	64	100
2. Total cases cleared (Includes the number of cases of trouble cleared, thereby preventing a system interruption. May include the interruption of other circuits or equipment.)	40	8	2	8	5	63	98
3. Total cases cleared correctly on the voltage concerned (Includes the cases of trouble in which a minimum number of automatic switches operated on the voltage concerned and no necessary switches on this voltage failed to operate. However, some switches may trip out incorrectly on other voltages.)	39	8	1	6	5	59	92
4. Total cases cleared correctly considering switch operations on all voltages (Tripping out of switches by over-voltage or under-voltage relays are considered as correct operations.)	39	7	0	5	5	56	88
Automatic switch operations							
1. Total number of automatic switch operations necessary for the correct clearance of trouble (Includes the correct number of switches which should have kicked out in order to clear the trouble from the system.)	54	11	6	21	22	114	100
2. Total number of automatic switches which operated correctly to clear the trouble on the voltage concerned (Includes the operation of all switches tripped out by over-voltage or under-voltage relays.)	54	11	4	20	20	109	96
3. Total number of unnecessary automatic switch operations (Includes all switches which tripped out incorrectly at time of trouble. Operations due to unknown trouble may be considered as correct.)	12	3	0	16	0	31	27
4. Total number of automatic switches which failed to operate (Includes all switches which did not trip but should have tripped in order correctly to clear the trouble.)	1	0	2	0	2	5	4
5. Total number of automatic switch operations (Includes every switch operation, 11-kv., or above, that appears to be caused by some case of trouble. Trip-outs of switches when closed in on test are included; operations due to trouble in control equipment and relays are included; accidental trips or switches dropping out due to mechanical trouble are not included.)	66	14	4	36	20	140	123
Causes of failures							
Of the unnecessary operations:							
Synchronous machines falling out of step	10	0	0	3	0	13	
A. C. trips failed or delayed in operation*	1	0	0	0	..	1	
Improper relay setting	0	1	0	10	0	11	
Failure of control wiring	0	2	0	1	0	3	
Failure of battery on 11 kv.	0	0	0	1	0	1	
Failure of CO relay	1	0	0	0	0	1	
Unexplained operation of CR relay	0	0	0	1	0	1	
Of the switches failing to operate:							
Failure of battery	1	0	0	0	0	1	
Failures unexplained	0	0	0	0	2	2	
Improper relay setting	0	0	2	0	0	2	

*All plunger relays and series trips are included under "A. C. trips." Failure of any piece of equipment is recorded only when found so by results of test or proper inspection.

tirely removed, thereby lowering the dielectric strength of the oil.

One transformer manufacturer has overcome the objections outlined above by developing a radiator of such sturdy construction that it can be welded to the transformer tank at the factory and the transformer shipped complete with all oil in the transformer and radiators, thereby eliminating the trouble and expense of installing radiators and handling oil in the field. This radiator is of rugged construction, yet light in weight. It is made from copper-alloy steel approximately twice as heavy as the steel used in the ordinary tubular-type radiator. There are no pockets or crevices either inside radiators are accessible on all sides for cleaning and painting without removal from the tank.

This radiator offers maximum cooling efficiency. It is about twice as efficient as any transformer radiator heretofore produced and permits the shipping of transformers built as large as 15,000 kva., self-cooled and complete with oil and radiators installed, on standard railroad cars. Units up to 20,000 kva., self-cooled, can be shipped complete with oil, and radiators attached permanently, by using drop-bottom cars.

Power Interchange

This is a topic upon which there has been much interesting discussion as to the various means by which interchange of power is made possible. The year just past no doubt witnessed the largest interconnection of different power companies ever consummated. The experience gained with this great interconnected net work has been very valuable to all of the various utility companies as there have been the many questions of various frequencies and voltages to be met.

The following reports from member companies on this subject are submitted and appear in full later in this report:

"Frequency Changer Operation," by L. L. Dyer and E. R. Stauffacher; "Power Interchange in San Joaquin Valley in 1924," by R. D. Likely; and "Pacific Gas and Electric Company Power Interchange,"by H. T. Sutcliffe and B. D. Dexter.

Relays and Relay Application

The proper operation of any system and especially a net-work system of transmission lines is so closely related to the proper functioning of the relays and protective devices that no study of electrical apparatus is complete without careful consideration of the many relay problems involved. Such a study has a direct bearing upon reduction in investment and operating costs. The proper functioning of relays results in very great savings by preventing damage to equipment and eliminating hazards and also increases revenues by preventing unnecessary system interruptions by reducing any interruption to the particular line or station involved in the disturbance. Then, too, the proper application of relays permits the operation of a transmission system particularly a net-work system, to derive the greatest benefit from the carrying capacity of the line conductors by having such a system completely tied together through the net work. This gives diverse feeds into certain stations and assures that any trouble will be taken care of by the proper functioning of the relays on the lines involved.

Therefore the apparatus bureau during the past year has spent much time in the consideration of the topic of relays and relay applications. There has been some discussion as to the necessity for definite specifications for relay operation that records may be kept of each operation. The following classification is suggested:

(1) Correct operations
(2) Incorrect operations
(3) Unnecessary operations

These operations are to include the action of the oil-circuit breaker involved. As to whether it is proper to include the action of the oil-circuit breaker in relay operation is no doubt open for discussion. In any event if improper oil-circuit breaker operation occurs, as it does on most systems, then greater attention must be paid to the overall testing and maintenance of both relays and oil-circuit breakers as either, without the proper functioning of the other, is useless.

Several of the member companies are keeping records of the operation of their relays for further study. The Southern California Edison Company has devised a card system known as "Protective Equipment Record" which is used with cards of four colors as follows:

Blue, for 220 kv. and 150 kv.
Salmon, for 60 kv. and 30 kv.
Cream, for 15 kv. and 11 kv.
White, for all below 11 kv.

These cards all carry the same data and are arranged to carry information on both sides. Fig. 2 shows one of these cards.

The value of the information which may be derived from the study of relay operation is illustrated in Table II, the original of which was submitted by E. R. Stauffacher of the Southern California Edison Company. A report similar to the one shown is drawn up monthly and yields much valuable information.

New or Unusual Applications of Relays

Under this heading it is believed that a general statement of the practices developed by various Western engineers for the protection of intricate transmission net works will be pertinent and of general interest. Several different methods of application of standard and modified-standard relays are in use by the different companies. Papers covering this subject have been prepared and appear in full later in this report. These papers are: "Relays and Relay Application," by R. C. Denny; "New Types of Protective Relays," by H. T. Sutcliffe, R. W. Wilkins and H. S. Lane; "Relay Protection as Applied to a Large Transmission Network," by R. W. Wilkins.

Relative to the subject of relay protection is the subject of the calculation of short-circuit currents. A knowledge of at least an approximation of the amount of current delivered over certain lines under conditions of stress is essential to the intelligent application and setting of relays. Measurements in this case are impossible and calculations impracticable. Hence most power companies of any size have built up a "dummy" system on a small scale. From the "dummy" current deliveries under conditions of trouble may be determined with acceptable accuracy. A description of the "dummy" system, or "calculating board," as it is called, used on the San Joaquin system is given by R. C. Denny in his paper "Design and Application of System Calculating Board," appearing in full later in this report.

New Equipment

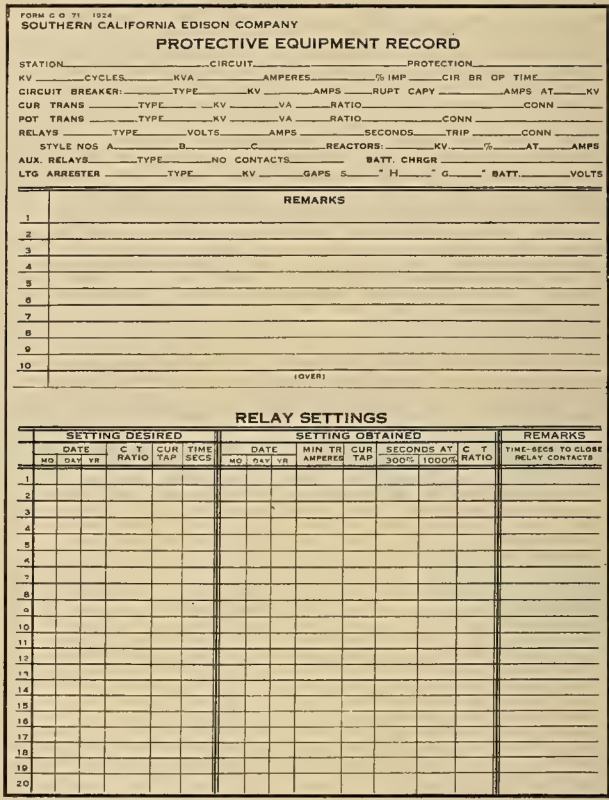
The bureau is interested in following the installations of electrical equipment as they are made. By thus following the latest applications of new equipment much information of interest and value to members and member companies may be derived. "Switchboard Instruments and Wiring" by Roy Martindale is published later in this report and gives a description of the metering installation at the new Hollywood substation of the Los Angeles Bureau of Power and Light.

There has been heavy demand for an inexpensive type of high-voltage current transformer suitable for relay operation and also metering. The characteristics of the bushing type of current transformer are such as to be unfavorable for this latter type of service. There has been developed by a Pacific Coast manufacturer, the Pacific Electric Manufacturing Company, what is known as the meter type transformer which is manufactured for service at 35-45 kv., 60-73 kv. and 125-132 kv. This transformer is mounted immersed in oil of the oil-circuit breaker. A paper on the "Characteristics of Pacific Electric Manufacturing Company Meter Transformers" appears in full later in this report.

Automatic Stations and Equipment

There has been a very consistent increase in the application of automatic reclosing equipment to substations and the results attained have been beyond the expectations of those who recommended their installation. One of the first companies to install automatic substations was the San Joaquin Light & Power Corporation and the report submitted by E. K. Sadler, "Automatic Substations on the San Joaquin and Affiliated Systems," appearing in full later in this report gives some interesting information covering these installations.

Automatic substation installations being made on the system of the Pacific Gas and Electric Company are covered in a paper by R. B. Kellogg, H. T. Sutcliffe and B. D. Dexter on "Design and Operation Features of Automatic Substations," appearing in full later in this report. "Design of Automatic Regulator Heads," by



FORM C O 71 1924
SOUTHERN CALIFORNIA EDISON COMPANY
PROTECTIVE EQUIPMENT RECORD

STATION ____ CIRCUIT ____ PROTECTION ____
KV ____ CYCLES ____ KVA ____ AMPERES ____ % IMP ____ CIR BR OP TIME ____
CIRCUIT BREAKER: ____ TYPE ____ KV ____ AMPS ____ RUPT CAPY ____ AMPS AT ____ KV
CUR TRANS ____ TYPE ____ KV ____ VA ____ RATIO ____ CONN ____
POT TRANS ____ TYPE ____ KV ____ VA ____ RATIO ____ CONN ____
RELAYS ____ TYPE ____ VOLTS ____ AMPS ____ SECONDS ____ TRIP ____ CONN ____
STYLE NOS A ____ B ____ C ____ REACTORS: ____ KV ____ % ____ AT ____ AMPS
AUX. RELAYS ____ TYPE ____ NO CONTACTS ____ BATT. CHRGR ____
LTG ARRESTER ____ TYPE ____ KV ____ GAPS S ____" H ____" G ____" BATT. ____ VOLTS

	REMARKS
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
	(OVER)

RELAY SETTINGS

	SETTING DESIRED						SETTING OBTAINED								REMARKS
	DATE			C T RATIO	CUR TAP	TIME SECS	DATE			MIN TR AMPERES	CUR TAP	SECONDS AT		C T RATIO	TIME-SECS TO CLOSE RELAY CONTACTS
	MO	DAY	YR				MO	DAY	YR			300%	1000%		
1															
2															
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Fig. 2—Showing (above) the face and (below) the reverse side of the protective equipment record card used by the Southern California Edison Company. This card supplies a continuous record of all changes in relay settings or of other like equipment in the order in which they are made.

J. L. Landon, appears in full later in this report and gives some interesting information on that subject. "Some Features of Automatic Generating Plant Design and Operation," by R. C. Denny, appears in full later in this report.

Station Electrical Grounds and Control of Grounds

Great interest is manifested in this subject and much study has been given toward the improved efficiency of grounding systems. Pertinent to this are the efforts toward the actual measurement of the resistance of the ground return circuits between stations. Greater care should be taken not only to secure better grounds, but frequent tests and inspections should be made to determine the value of such grounds as established.

Papers on this subject following later in this report are "Ground Current Control and Station Electrical Grounds," by F. H. Mayer, D. J. Kennelly and H. L. Sampson; "Station Grounds on the San Joaquin System," by H. N. Kalb; and "Station Grounds on Pacific Gas and Electric Company System," by B. D. Dexter, H. S. Lane and H. T. Sutcliffe.

Fire-Fighting Methods and Equipment

This topic is one which vitally concerns all operating men of public utilities as there always is the hazard of failure of oil-filled apparatus, generating equipment, etc., any of which may result in serious fires, crippling the plant output and creating great damage. Many schemes have been evolved and put into successful operation for the protection of generating equipment by the use of closed systems of ventilation, dampers in air ducts, differential relay protection to immediately

disconnect machines from the line and from field excitation and the use of water, steam, carbon dioxide or carbon tetrachloride for putting out such fires which once started.

The committee this year has studied the many angles of proper fire-fighting equipment and the failures of oil-filled apparatus hoping to profit very materially from them.

The following reports are submitted: "Fire-Fighting Equipment Used by L. A. Bureau of Power and Light," by H. H. Cox; "Fires Caused by Failures of Oil-Filled Apparatus," by H. A. Laidlaw; "Fire-Fighting Practices of San Joaquin Light & Power Corporation," by J. M. Buswell; "Fire-Fighting Equipment and Experiences of the Edison Company," by J. C. Gaylord, H. L. Sampson and L. L. Dyer; and "Fire-Fighting Apparatus at Long Beach Steam plant No. 2."

Suggested Program for Ensuing Year

There are many topics each year which in themselves are desirable for study by this committee, but which may not be of interest to the greatest number of those on the committee. In order to determine subjects of interest with the least possible delay, careful consideration was given to these topics at the Fresno meeting and the following were agreed upon as a recommended program for the coming year. This is of course subject to change should the incoming chairman so desire.

(1) Pacific Coast practices in transmission and distribution substations. This should be the major topic.

(2) Tests of station grounds. Further information on this subject is very desirable.

(3) Oil-circuit breakers
  (a) Report of any tests which may be conducted by Pacific Coast companies.
  (b) Gather data and study oil-circuit breaker operation through a special committee in conjunction with the member companies in the use of form adopted by apparatus bureau at Fresno meeting.

(4) Review of transformer voltages in conjunction with the overhead systems committee.

(5) Relays and relay application
  (a) New types of relays for the protection of transmission net works.
  (b) New types of relays for the protection of internal trouble in equipment.
  (c) New or unusual application of older types of relays.

(6) Lightning arresters.

(7) High-tension fuses.

(8) Carrier-current telephone communication. (This last topic not definitely decided upon.)

In the carrying forward of the work of the apparatus bureau for the ensuing year, the chairman can ask nothing better for the incoming chairman than that the same cooperation be extended to him that has been given to the chairman this year.

The activities of the committee are wonderful clearing houses of information, for good fellowship and for the "rubbing of elbows" with the men of the industry. For all of these and for the wonderful cooperation the chairman is deeply grateful.

Increasing Oil-Circuit Breaker Interrupting Capacity

By H. H. Cox

THE development of the oil circuit breaker in southern California dates back almost to the beginning of oil switches. Oil switches first were made locally because the operating companies had to have something better than ordinary knife switches. Later, locally made oil switches came to be quite extensively used for two reasons. First, because they could be obtained cheaply. Low first cost was quite essential for many of the pioneer extensions. Second, because they could be obtained much quicker than from Eastern factories.

About twelve years ago the problem of interrupting capacity was encountered. Due to the growth of the generating plants, switches began to fail. This problem first was met by increasing the physical size of the switch, larger tanks, longer breaks and contacts deeper in oil. The next step was changing from two breaks per phase to four breaks. This change so increased the interrupting capacity that for several years everything was all right. Finally, four break switches began to fail and the next step was the development of the six-break switch. Again the problem was solved for a few years and then the six-break switches began to fail by bursting their tanks, throwing oil and in other ways demonstrating their inadequacy. Up to this time all tanks had been rectangular and of fairly light sheet metal. It was seen that rectangular tanks would not stand the internal pressures developed. The next step

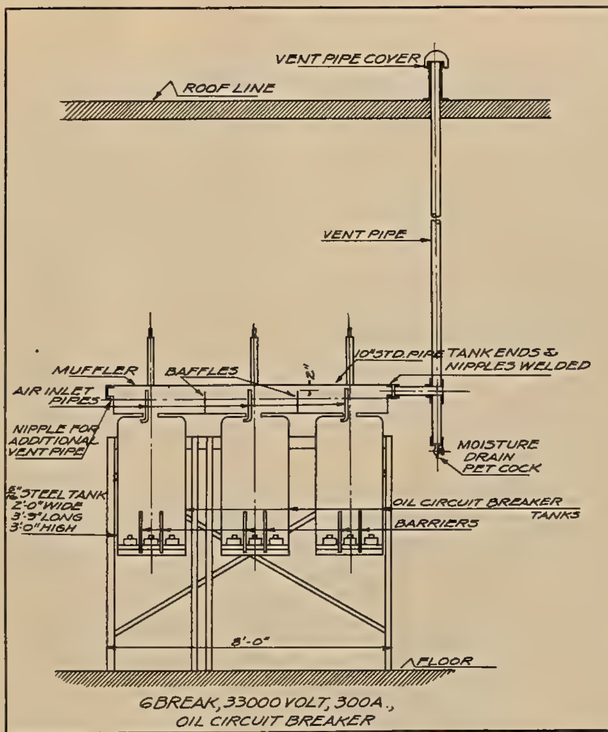


Fig. 1—Semi-schematic diagram of a 6-break, 33-kv., 300-amp. oil circuit breaker showing the explosion header and the vent pipe which carries the gases to the roof.

was to make the tanks into a form which would withstand internal pressure. This produced a cylindrical tank with a rounded top and bottom of heavier sheet steel, all seams being welded. A manhole cover on the top held down by coil springs provided a relief valve to reduce excessive internal pressure.

Today there are operating in southern California six-break switches of this type which are interrupting successfully 33-kv. short circuits of 750,000 kva. and 66-kv. short circuits of even greater volume. A few of these switches have been made having ten breaks per phase. However, the tendency at the present time seems to be to stick to the six-break switch and strengthen the tank rather than to use the ten breaks.

In rebuilding some of the older switches and in some new switches which are to be used indoors and in limited space it was not possible to utilize the round tank idea, consequently the nearest possible approach to it is used. Oval tanks with specially-reinforced sides and bottom of heavier plate and with cast-steel tops are proving successful. Particular attention has been given to the tank welding in order to gain all possible strength. Realizing that a high pressure is produced in a breaker during the period of interrupting heavy short circuits and that considerable gas is generated from the decomposition of the oil by the arc, it was decided to be impractical to try to make the tank strong enough to hold under all circumstances. Consequently means were designed whereby this pressure could be relieved. This has resulted in a manifold extending across the three tanks of a switch that acts both as a relief space and as oil separating chamber. This manifold is vented to the outside of the station building. The vent is carried outside because the gas generated in a switch is almost pure hydrogen and is highly explosive when mixed with air. An illustrative sketch of this switch is shown in Fig. 1 which will give the general details of design. The vent pipe is 2-in. or 3-in. iron pipe.

On some of the switches upon which was first tried the venting scheme a 3-in. pipe manifold was used with a single vent pipe. This proved inadequate and was later replaced by running a separate 3-in. vent pipe

direct to the outside of the building from each tank. So far this has proved successful for the interrupting duty required in that particular location.

Fig. 1 shows a six-break switch arranged with external vent.

Oil-Circuit Breaker Experiences and Problems

By H. S. MINOR

OF "Progress in Higher-Voltage Breakers" to increase the rupturing capacity, the means employed by the various manufacturing companies are familiar to most. The more common of these are: increase in speed of break, increase of number of breaks, increase in strength of tanks and parts, vents for the handling of oil and gas pressures, and other similar advances. It is believed that we are more interested in the operating experiences and installation difficulties encountered with various type of switches. These experiences of the San Joaquin Light & Power Corporation show that all of these points must be given careful thought when considering the design of a switch. We have used one line of oil switches with a higher rating than switches formerly used that do not stand up to the service required as well as the older type. Several of these newer switches have been bent all out of shape on several occasions, most of the oil blown out and a bad service interruption caused. In changing the design the tanks had been made stronger and deeper, the break occurring under a greater depth of oil, but the top of the switch was not made strong enough to take care of the strains to which it was subjected.

The same line of switches was equipped with an improved type of operating mechanism which has proved to be so delicately set that the switches trip out on many occasions when no trouble is found on the lines, these interruptions being much more frequent with this newer type. The operating mechanism is one of the most important parts of the switch gear and must be made rugged and dependable. Some switches are found where it is necessary to work over the parts of the operating mechanism before the switch will function properly. On some outdoor switches the mechanism has not been housed properly and after being exposed to the weather for some time has failed to operate. On still other switches where the operation has not been satisfactory a factory man has been sent out on the job and a few newly designed parts added.

We have also several switches of large carrying capacity which run hot when subjected to about 75 per cent or less of their nomal ampere rating. On some occasions it has been necessary to install a ventilating system to keep the switch cool enough to be operated safely.

There seems to have been too great a tendency for the manufacturing companies both large and small to build something in the way of an oil switch and try it out on some power company's system and later attempt to improve it if not satisfactory. Only during the last few years has any attempt been made to subject switches of different design to tests of the conditions under which they are supposed to operate.

Practically all of the distribution outside of the larger towns and cities within the company's territory is at 11 kv. Until within the last few years at most of our substations these lines radiated from indoor type oil switches which have been housed in wooden frame corrugated iron buildings with concrete floors. These buildings have been satisfactory for the size stations for which they were built but as the loads increase and the transformer installation is increased it becomes necessary to consider cell structures and isolation of phases in order properly to provide the rupturing capacity needed. In some of the larger substations the company has used this form of construction. In others an outdoor type switch supported on a pipe structure has been used. It is found that the outdoor type of substation is much cheaper than the fireproof building and cell structure equipment which it replaces. The company has believed that it is just as satisfactory and operating experience bears this out. It is hard to find on the market many outdoor type oil switches of great rupturing capacity which are built for 11 kv. service.

Rupturing capacity becomes a more and more important consideration as the load on a system grows. When the transformer installation at a substation is increased it soon becomes necessary also to increase the size of the oil switches. The same condition exists when considering the switches on the transmission system. Sometimes it is difficult or impossible to utilize the smaller switches which are being removed from service. It was necessary to face this sort of a problem

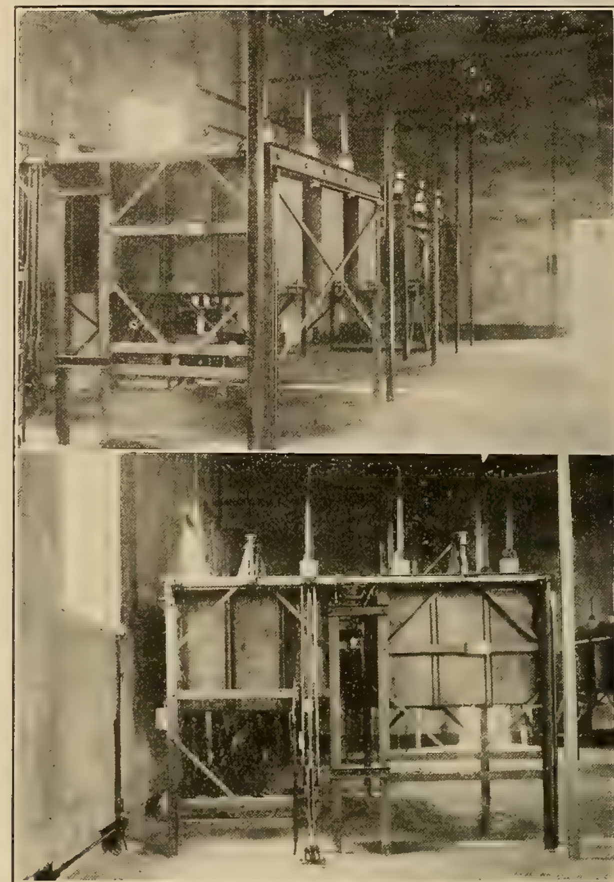


Fig. 1—Showing two 2-break oil circuit breakers built together to form one 4-break oil circuit breaker.

when considering the switch eauipment at Power House No. 1 and at Copper Mine Substation. These two stations had been connected by two 60 kv. trunk lines of small wire which are being replaced by a tower line supporting one circuit of heavy conductor. All of the switches in service were 60 kv., two-break, indoor-type, and had thrown oil on several occasions. At times considerable damage had been caused. Switches of larger rupturing capacity were needed.

At the Copper Mine Substation there are four 60-kv. lines including the new line to P.H. No. 1. To install four outdoor type 60-kv., four-break oil switches with disconnects, buses, etc., mounted on steel structures would cost $25,000. This would leave six of the indoor-type, two-break oil switches on hand and a fire-proof building 30 ft. x 70 ft. for which there would be no particular use. The idea of making a four-break switch out of two of the two-break switches was considered and it was found that two of the switches could be tied together mechanically in a satisfactory way so that they would operate as a four-break switch. The expense was less than $50 for each pair of switches. By installing one additional four-break switch and using the six two-break switches in three sets of two it was possible to equip each of the four lines with a four-break switch. The cost of this installation is about $10,000, a saving of $15,000 effected by using the equipment in this manner. There have been several interruptions since these rebuilt switches were placed in service, all of which were handled without any difficulty. Fig. 1 shows an example of this reconstruction.

Similar switches had been in use at Power House No. 1. The switches are solenoid operated while those at the Copper Mine Substation were hand operated. Here the switches are installed in a long narrow switch

gallery and it was not possible to place two of these switches side by side as was done at the substation. Instead they were placed end to end. Bell crank supports were reinforced and the throw of the pallet switch adjusted so that the same operating solenoid could handle the four-break switch. The cost of this job was not over $10 for each set of switches. There are two 60-kv. lines to take care of at the power house and the cost of an outdoor installation of new four-break switches would be about $12,500, while the installation inside the building using the old switches cost about $2,500. It would have cost about $9,200 to install two new four-break oil switches inside the building.

The company has used transformer oil in oil switches in place of approved switch oil at a saving of about

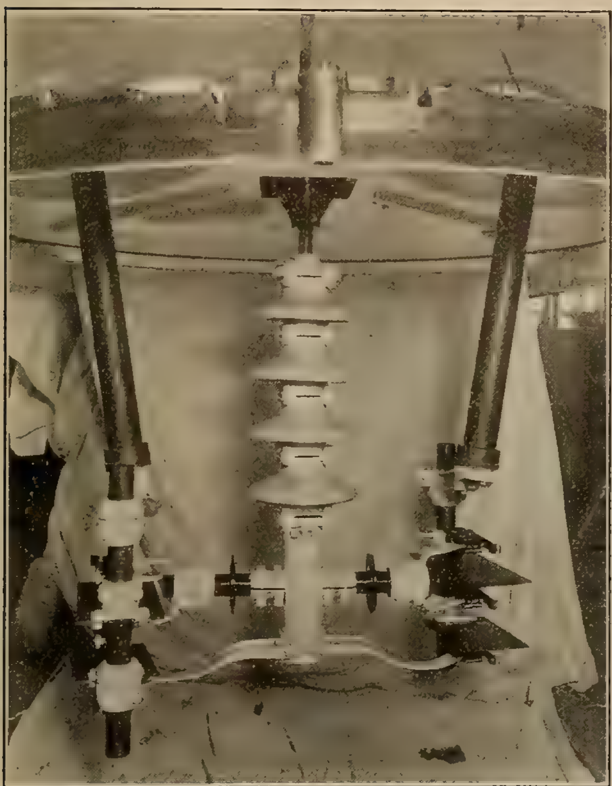


Fig. 2—Showing mechanism of 6-break oil circuit breaker manufactured by Pacific Electric Manufacturing Company of San Francisco.

25 per cent in the cost of the oil and has had no operating difficulties with it.

As yet no means of interlocking the disconnects used in connection with oil switches has been developed.

Tests have been made with a cycle counter on the speed of opening of oil switches. This disclosed a variation of from 6 cycles to 17 cycles in the time required from trip to the point where the blade leaves the clip and a variation of from 12 cycles to 15 cycles from the beginning of opening to the end of stroke.

According to one of the manufacturers of oil circuit breakers distinct progress in the design and manufacture of oil circuit breakers in the higher voltages has been shown, especially with regard to ease of installation, maintenance and operation mechanisms. The General Electric Company, which manufactures oil circuit breakers with explosion chambers, has embodied in some of its present standard lines of these breakers an improved-design explosion chamber, which makes it unnecessary to remove the explosion chamber when installing new contacts, where this removal formerly was required. This improved design materially cuts down the out-of-circuit period of an oil circuit breaker for the purpose of changing contacts.

Regarding ease of installation, actual experiments have been made by the General Electric Company with breakers crated and braced on freight cars to determine whether or not it would be practical to ship triple-pole breakers in one unit, thus requiring no re-assembly at the point of installation. These experiments have been very successful and the company now ships oil circuit breakers up to and including the 73-kv. size as a unit so that the three poles may be simultaneously mounted without any re-assembly. Of course the solenoid or motor mechanism must be attached to the finished framework after its installation.

Further improvements have been made in the higher-voltage breakers by the installation of separating chambers. The breakers themselves have been made oil and gas tight so that the only exit for gas is through the separating chamber. The function of the chamber is to minimize oil throw, to condense oil vapor formed by contact of arc and oil during an interruption and to cool the arc gas before it is discharged into the atmosphere.

It is true that the interrupting capacity of a breaker depends upon the speed of the break, but it does not follow necessarily in every case that the higher the speed the greater the interrupting capacity. The interrupting capacity of a breaker depends upon not only the quantity of gas generated, but also upon the speed of generation. Therefore it may be possible and quite likely that a given breaker if operated at a higher speed will have less interrupting capacity. The General Electric Company has observed from numerous tests that for a given breaker a higher operating speed may well be expected to result in a longer arc, more gas, and more pressure than would result from a lower operating speed. Therefore it becomes necessary to know a great many other factors relating to the particular design of breaker in question in order to determine whether or not a higher speed would have any advantageous effect upon the interrupting capacity. All of the foregoing, relating to the speed of break, is based upon the assumption that the moving contacts will travel at practically uniform speed. As a matter of fact, however, every breaker will have its own speed characteristic and this characteristic at no load may be decidedly different from the speed at full interrupting capacity. In fact, at some particular load the action may not only slow down, but actually stop and reverse in direction so as to reclose the breaker. There are several reasons for this behavior and one of the plain-break breakers can be considered as entirely unaffected by it. Whether or not the defect is a serious one in any particular case can be determined only by actual test of the breaker under severe operating conditions.

In the case of fairly low-voltage breakers operating to interrupt large current, the actual speed of the moving contact may have little relationship to the interrupting capacity of the breakers as such breakers interrupt the arc by the magnetic-blowout effect instead of by physical separation of contacts. It may be found, however, that the heaviest stress is not produced by the largest current interrupted and that more gas and greater pressure is produced when interrupting smaller currents. This fact must be considered in the rating of the breaker.

The necessity of employing an adequate muffler or separating chamber on oil circuit breakers to eliminate as far as possible the escape from the breaker tanks of oil and gas is apparent in view of the increasing number of specifications calling for these devices. The separating chamber developed by the General Electric Company for outdoor breakers consists of an iron pipe with a 180 deg. elbow at one end and a screen on both ends. This pipe is filled with quartz pebbles and has been given many thousands of tests. Other mufflers or separating chambers also were tested, but the present design proved to be superior. This chamber has been in actual service for over two years and functions as intended, there being no escape of gas or oil. The oil vapor which is forced into the chamber along with the gas is condensed on the surface of the pebbles and returns to the oil tank. At the same time, the gas passes through the quartz stack, being cooled in passage and finally exhausted into the atmosphere.

The design for indoor breakers is quite similar except that for the "H" type the chamber consists of an insulating material. The design and operation, however, is exactly the same as described for outdoor breakers.

It is the recommendation of the manufacturer that a header be used for a group of indoor breakers, the number per group to depend upon the size of the header and the severity of the service. It is believed that it will be found that generally ten or twelve breakers can be connected to one header of ample size. Should the

total number of breakers exceed twelve a second header is recommended.

By all means it is advisable to extend the header and exhaust the gas out of doors. However, in stations where there is ample head-room there is no objection to exhausting each breaker or groups of breakers directly into station. When this is done care must be taken that the end of the exhaust pipe is beyond any line-buses or breaker-mechanism parts where there is likelihood of a spark. The gas as it is exhausted becomes explosive when combined with sufficient oxygen from the atmposphere. Diffusion is so rapid that no explosion can take place after the gas has been exposed to the atmosphere for a few seconds.

A Pacific Coast manufacturer of oil-circuit breakers states that "The Pacific Electric Manufacturing Company has in operation a large number of the new six-break design of oil-circuit breakers and the operation of these has been very carefully checked up by reports from the operating companies and as unfavorable comment or apparatus failure is very much more likely to become known to the manufacturer, it is believed

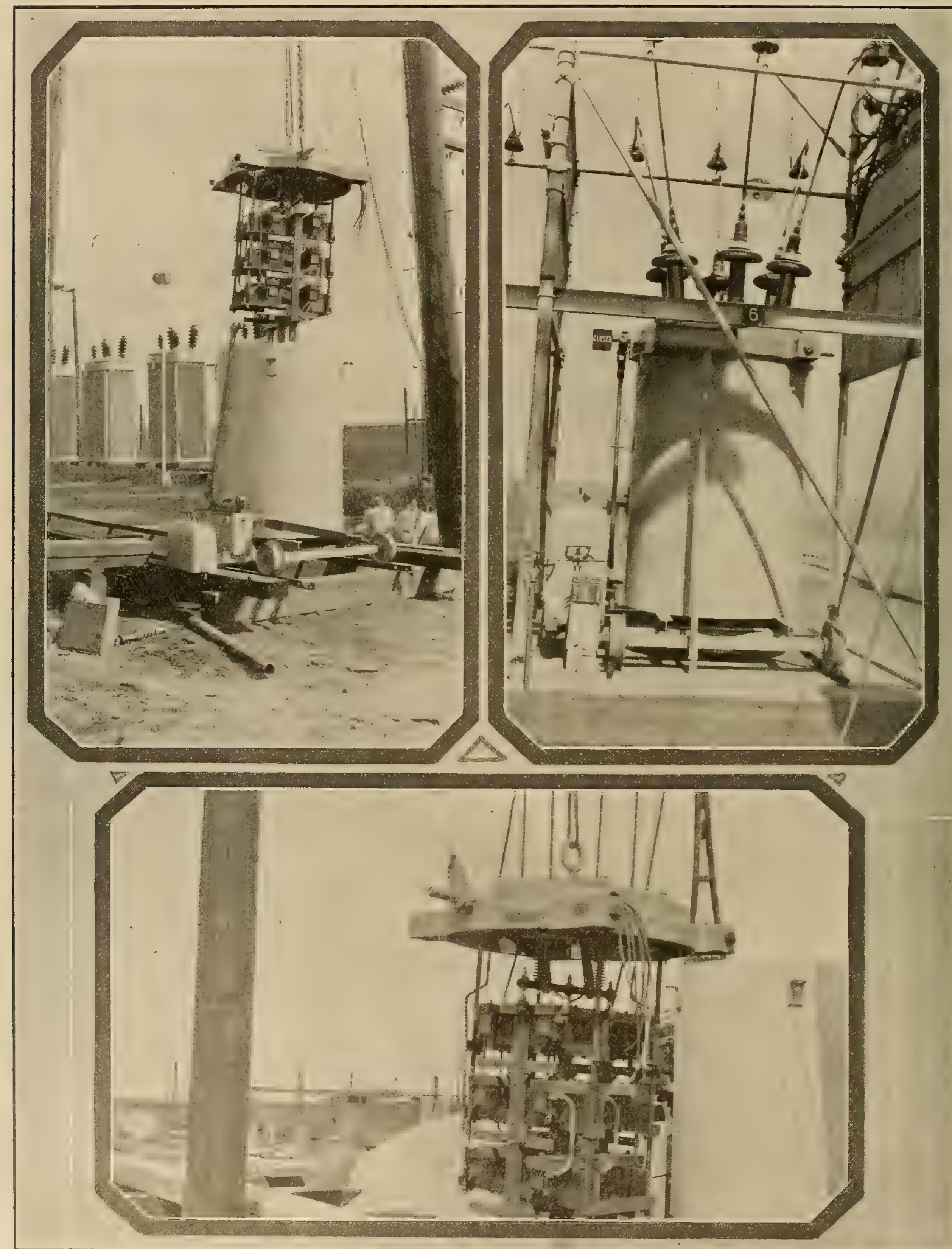


Fig. 3—Several views of type F-6, 300-amp., 15-kv. breaker manufactured by Kelman Electric & Manufacturing Company, Los Angeles

that the lack of any such comment indicates that these breakers are fully meeting the requirements. These breakers are being made for voltages up to 135 kv. and may be six-break or more as the six-break, horizontal, rotating design as developed permits the addition of breakers by duplication of the parts in multiples of four so that ten-break or fourteen-break switches can easily be built, using parts now used in the six-break design." Fig. 2 shows the six-break mechanism assembled on "dummy" supports in lieu of insulators.

Another Pacific Coast manufacturer, the Kelman Electric & Manufacturing Company, also manufactures multi-break oil-circuit breakers of the pantograph type so arranged that the number of breaks can be increasea up to ten per phase for voltages up to 135 kv. This company also has developed a six-break, three-phase, outdoor, round-tank type oil-circuit breaker for 15 kv. service in which all three phases are in the same tank and separated by suitable barriers. This breaker may either be suspended from a suitable switch structure or mounted on trucks as desired. It also is equipped with bushing-type current transformers. Fig. 3 shows some of the details of this most interesting breaker known as the Kelman Type F-6.

With the increase in capacity of breakers there has been an increase in size and weight of moving parts and the effect of increase of inertia in these moving parts must be given serious consideration. Efforts must be directed toward refinements in the operating mechanism in order to maintain proper operating speed. Roller bearings, universal joints and other similar developments in the operating mechanism of very large breakers are desirable where they increase the operating speed.

Rating of Oil-Circuit Breakers

The subject of rating oil-circuit breakers is one which vitally affects the operation of all power companies. The function of operating companies is to give service and of the manufacturers to furnish the necessary equipment. Duties of breakers are becoming increasingly severe and breakers must meet these conditions as a reasonable cost. The present cost of high tension breakers is very large. Systems can not be built around breakers nor service curtailed because of breaker limitations. Better breakers are needed.

A few paragraphs from the report of the a.c. substations subcommittee of the Electrical Apparatus Committee, N.E.L.A., Mr. E. C. Stone, chairman, very nicely summarized this problem.

Results of Tests on Oil-Circuit Breakers of Pacific Coast Manufacture

IN order that information might be made available concerning the capacity of oil-circuit breakers manufactured on the Pacific Coast the following reports covering tests already made are submitted.

The Pacific Electric Manufacturing Company submits the following information covering tests of a six-break oil-circuit breaker, solenoid control, automatic release:

A 66-kv. six-break Pacific circuit breaker was installed at a large central switching station that its action might be observed while it was protecting the circuit during the testing of various types of fuse tubes. The circuit breaker operated ten times, interrupting the circuit when the arc from the fuse tubes failed to rupture.

It then was given three tests on direct short circuit. The first test with one single power house on the line caused so little evidence of disturbance that the circuit breaker then was connected to the main distributing lines, supplied by five large power houses and several smaller ones, and was operated twice on short circuit.

The oscillogram shown in Fig. 1 is that taken during the last short circuit operation. In the oscillogram, line "A" is the direct current tripping coil circuit, line "B" is the line current record reading approximately 1,500 amperes after the first cycle, and line "C" is the 60-kv. bus voltage. A time element relay was connected in the tripping circuit and this relay was operated from current transformers built into the circuit breaker.

It will be seen by reference to the oscillogram that the time limit relay connected the tripping coil during the fifth cycle after the short circuit was established. A period of sixteen cycles then was consumed in the mechanical operation of tripping, moving the blades clear of the contact arcing tips and drawing the arc.

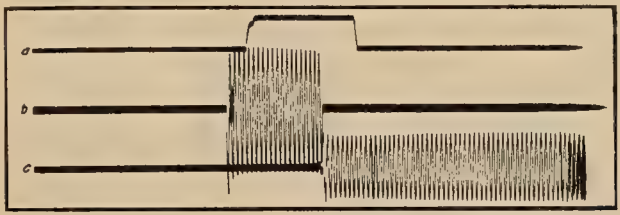


Fig. 1—Oscillogram of short circuit test of Pacific Electric 66-kv. 6-break oil circuit breaker.

About six cycles thereafter the mechanism opened the tripping coil circuit. At the time of opening the tripping coil circuit, the blades of the circuit breaker and the actuating mechanism had not entirely completed their travel by about five cycles. The whole operation of short circuit, rupture and reestablishment of potential consumed a period of 30 cycles.

Interrupting Capacity of Oil-Circuit Breakers Manufactured on the Pacific Coast

By C. C. LONG and L. L. DYER

NO laboratory or special tests ever have been made by the Southern California Edison Company to determine the interrupting capacity of circuit breakers purchased from Pacific Coast manufacturers excepting the tests on the Kelman type Y15 switch described in another report. However, it may be of interest to have some data on certain installations where these breakers have been used satisfactorily. This should be of benefit to others contemplating the use of the same type of breakers.

The Kelman type CB70, four-break, 70-kv. switch was installed in several substations about four years ago. At Vestal substation these breakers are in the 60-kv. line connecting to a bus fed by a bank of 34,500-kva. transformers from the 150-kv. bus which in turn is fed by means of auto transformers from the Big Creek 220-kv. transmission lines. Two substations of 30,000-kv. transformer capacity use these switches in lines connected into the 60-kv. network around Los Angeles. The computed short circuit current at the 60-kv. buses of these latter two substations is approximately 6,500 amp. So far these four-break switches have performed satisfactorily except for bulging the sides of the square tanks when operated under heavy short circuits. Because of this defect no more of this type are being installed.

At Laguna Bell the 60-kv. circuits are handled by Kelman type D6 switches which have given satisfactory service for two years. This 60-kv. bus is fed from the 220-kv. Big Creek transmission lines through two banks of 60,000-kv. transformers. A 30,000-kva. synchronous condenser through a 30,000-kva. bank of 60/6.6-kv. transformers adds to the duty on these breakers. The computed short circuit on this 60-kv. bus is around 13,000 amperes. To date the 60-kv. breakers never have been called upon to clear a close-in short circuit.

The Kelman type F6 switches have been used on 10- and 15-kv. circuits for something over a year. The most severe conditions under which they are operating are at Signal Hill and Santa Fe Springs substations. Here they are tied into the system through short 60-kv. transmission lines to Long Beach steam plant and Laguna Bell respectively. At each place the low-tension bus is fed by one bank of 9,000-kva. transformers, 60/11 kv. On heavy short circuits they throw some oil and blister their main contacts but so far there have been no failures chargeable to the switches themselves. At these two substations the computed short circuit current is about 6,500 amp. at 11 kv. These

breakers have opened short circuits on lines close to the substation at both places.

While these figures do not indicate the maximum interrupting capacity of the breakers, they give some idea of the installations in which they have proved satisfactory.

Short Circuit Tests on Kelman Type Y15 Oil-Circuit Breakers

By C. C. LONG and L. L. DYER

THE tests described were made on two Kelman type Y15 switches at the Katella substation of the Southern California Edison Company on Jan. 6, 1924. Two switches of this general type were used. One was of standard Kelman manufacture, while the other had been equipped with an auxiliary device called an "arc chopper." This device consisted of a fiber barrier so arranged that when the switch opened this fiber barrier was forced between the stationary contact and the movable switch blade by means of flat springs, thus cutting into the path of the arc that might pass between the blade and the contact.

Short circuit current for the first six tests was obtained from the substation equipment. A 10,000-kva. 11-kv. synchronous condenser was connected to one of the station buses. The circuit containing the switches under test was connected to this same bus through a circuit breaker of large rupturing capacity. This circuit was short-circuited on all three phases and equipped with current and potential transformers the secondaries of which were extended to a recording oscillograph. The Kelman circuit breakers under test were equipped with series tripping coils, standard equipment for this type of switch. The following method of test was used:

With the circuit breakers under test closed and the large circuit breaker connecting them to the bus open, the bus was energized from the main substation bus and the condenser brought up to speed. The test bus was then separated from the main station bus leaving the condenser floating on the test bus. Condenser voltage was quickly lowered to the required value and the main breaker closed, throwing the short-circuited line onto the condenser bus. As this all was quickly done before the condenser had time to drop much below synchronous speed it was possible to obtain the effect of a short circuit thrown upon a 10,000-kva. generator at the desired voltage. As this generator was of high internal reactance no damage could be done to the windings. No system disturbance could be caused because all test circuits were separated from the system at the time of application of the short circuit.

TABLE I.—Summary of tests on Kelman Y15 switches.

Test No.	Cond. volts	Short circuit amp. approx.	Short circuit amp. computed	Short circuit amp. at 11 kv.	Comment
1	6,000	1,000	No film	....	Little smoke—no oil thrown.
2	5,000	900	515	235	No smoke—no oil thrown.
3	9,000	1,500	1,530	1,250	Little smoke—little oil thrown.
4	8,500	1,400	No film	....	Little smoke—little oil thrown.
5	11,000	2,300	1,360	1,360	More smoke—1 pt. of oil thrown.
6	11,100	2,400	1,960	1,960	Lots of smoke—1 pt. of oil thrown.
7	11,200	over 6,000	No film	....	Switch failed to open—exploded and caught fire.

On test No. 7 the circuit containing the Kelman circuit breakers was thrown directly into the station bus. This bus was connected through a 15,000-kva. bank of transformers, 60/11 kv. to a 60-kv. line running directly to Laguna Bell. The 10,000-kva. condenser was disconnected for this test so that the short circuit current interrupted was that from the Edison system through about 30 mi. of 4/0, 60-kv. line and one 15,000-kva. bank of transformers.

In Table I is shown the value "short circuit amperes approximate" which is the reading taken on an ammeter in the circuit of the oscillograph vibrator. The value "short circuit amperes computed" is the effective value of current obtained scaling the current waves on the oscillograph films. The oscillograph had been calibrated before the test. This value is taken at the cycle in which the breaker started to open. In order to get a comparison between tests No. 2 and No. 3 and Tests No. 5 and No. 6 the values of "short circuit current computed" are reduced to the same condenser voltage by assuming that the duty on the breakers is directly proportional to the terminal voltage.

Tests Nos. 1, 3, 5 and 7 were made on the Kelman switch equipped with "arc choppers" while Tests Nos. 2, 4 and 6 were on the switch not so equipped.

Conclusions

No definite conclusions can be made as to the maximum amount of short circuit current which this switch will interrupt because not enough data was taken. Indications, however, are that the switch would satisfactorily handle 1,500 amp. at 11 kv. As far as could be determined the "arc choppers" were of no benefit. In fact the switch so equipped and used in Test No. 7 was badly damaged, the "choppers" being broken off by the force of the arc. However, this test was much more severe than this switch ever was intended to handle and no result other than that obtained could be expected.

High-Tension Oil-Circuit Breakers

By R. W. WILKINS, B. D. DEXTER and H. T. SUTCLIFFE

NO radical changes in oil circuit breaker design have been made since the type H switch was developed in 1905. As higher voltages and higher rupturing capacities were demanded, the existing breakers were modified to meet the new conditions.

Breakers for 110-kv. service simply were larger models of the existing 60-kv. breakers and the 220-kv. breakers simply enlarged 110-kv. breakers. In this way circuit breakers have come to be one of the limiting features of high tension transmission and require about as much maintenance as all of the remaining equipment combined. They require the most attention at the time of greatest stress, i.e., during line trouble, and their difficulties are liable to be forgotten when the trouble is over.

There also is a tendency on the part of operating companies to allow circuit breakers to remain in service long after they have become inadequate to handle the rupturing duty required.

Types in Use

There are in use on the Pacific Gas and Electric Company system the following types of high-tension breakers:

220 kv.: Westinghouse, 187-kv., 400-amp. breakers, solenoid operated.

110 kv.: both General Electric and Westinghouse, solenoid-operated switches in capacities up to 400 amp., together with a few horizontal four-break switches made by the Pacific Gas and Electric Company, and of a type represented by the Pacific Electric Manufacturing Company switches.

60 kv.: General Electric, Westinghouse, Pacific Electric, six-break; Pacific Electric, four-break; Pacific Gas and Electric Company, four-break.

One way of assisting the development of such equipment is to point out some of the defects developing during operation and such remedies, if any, as have remedied those defects successfully.

220-kv. Breakers

1.—Defects: (a) The small moulded insulators on the quick-break mechanism were inadequate, broke in service and were replaced by bakelite parts which seem thoroughly satisfactory.

(b) There seems to be insufficient reserve power in the solenoid operator so that rather critical adjustment is required between the closing of the dashpot and the opening springs.

(c) It is believed that these switches open much too slow, from 17 to 32 cycles being normal operating time. However, with limitations given in (b) and the weight to be moved the opening distance, no remedy has been developed so far.

2—Advantages: (a) Operating mechanisms are simple.

(b) Life and action of contacts under service is excellent.

(c) Oil stands up well, probably due to (b).

110-kv. Breakers

(1) K-type, General Electric Company, poor workmanship. There have been two cases where K-type breakers could not be assembled without changes. Several breakers have failed to operate due to poor bearings. There seems to be a considerably greater tendency to throw oil in the explosion pot type than normally would be expected. The adjustments are difficult to make and hard to keep.

(2) G-type, Westinghouse, much simpler than the K-type, easier to maintain and on present installations have shown less burning of contacts. In several cases the quick-break mechanism had to be remodeled. The operating mechanism housings have had to be ventilated to prevent mildew and rust. Adjustments easy to make and maintain when solenoid has enough reserve power.

(3 P. G. and E. 110-kv. type switches are four-break with the moving member moving horizontally as in the Pacific Electric Manufacturing Company design. The rotating member is supported on porcelain insulators which have given trouble by breaking.

These switches have to be opened as well as closed by solenoid and have at times caused trouble by not completely opening or by opening and bouncing back part way closed.

60-kv. Breakers

There are in use General Electric, Westinghouse, Pacific Electric six-break, Pacific Electric four-break and Pacific Gas and Electric four-break types.

The troubles noted on the 110-kv. switches also apply to the 60-kv. switches and in addition there are others due to inadequate rupturing capacity.

These four-break breakers are very low in cost as compared with the standard 60-kv. breakers and have many advantages over fuses. Therefore they can be used to advantage in a great number of cases where the cost of the standard breaker could not be justified.

Due to the number installed, almost as many as of all other types combined, more or less intensive investigation of their faults and troubles has been made and a summary is included with this discussion.

Several plans are under way for improving these breakers.

(1) By eliminating porcelain from the rotating member.

(2) By equipping the switch with a quick-break mechanism.

(3) By improving the operating mechanism.

This operating mechanism is designed to be operated

TABLE I.—Analysis of major switch troubles for year 1924

Voltage switch number and location	Type	Mfgr.	Nature of trouble	Remarks
60 kv., Sta. H., S. F.	400-amp., T. P. S. T., O. D.	P. G. and E. Co.	Bushing flashed over when switch opened on short	Bushing replaced, contacts overhauled.
60 kv., Sta. H., S. F.	400-amp., O. D., 4-break	P. G. and E. Co.	Blew up on short	Supporting insulators had come apart in-side tanks, allowing element to ground.
15 kv., Sta. F., S. F.	500-amp., H3	G. E. Co.	Broke down and caught fire when parallel-ing with Sta. A	Switch probably dropped out after being closed
15 kv., Sta. F., S. F.	300-amp., Type B, Style SO, T.P.S.T.	W. E. & M. Co.	Rat shorted leads just above the bushings	Bushings and terminal leads replaced
60 kv., No. 10, San Rafael Sub	2-break in tank.	P. G. and E. Co.	Arc between terminal bushing cracked ebony-asbestos top	Due to lightning
60 kv., No. 50, North Tower	4-break	P. G. and E. Co.	Switch tripped out after holding for a short interval	Probably due to a coating of paint on the latch
60 kv., No. 2	4-break in tank	P. G. and E. Co.	Arc between phases burned leads and broke bushing	Due to water leaking into switch tub from roof
60 kv. No. 30, Petaluma	4-break, grounded tank	P. G. and E. Co.	Revolving insulator broken in two	Switch tripped on short
60 kv., No. 10	4-break	P. G. and E. Co.	Arc between phases, bushings broken	Due to severe short
60 kv., No. 4, North Tower	4-break in insul-ated tank	P. G. and E. Co.	No switch trouble, external arc due to fall-ing bus tube	
60 kv., No. 5, North Tower	Air-break, discon-nect		Insulators flashed over	Due to spray from water oolling system
60 kv., No. 20, Cordelia	4-break in insul-ated tank	P. G. and E. Co.	One phase grounded, broke switch rods and asbestos top	Due to short, switch too small
60 kv., No. 16, Cordelia	4-break in insul-ated tank	P. G. and E. Co.	Switch failed, broke insulators, rods and tank	Due to short, switch too small
60 kv., No. 12, Cordelia	4-break in insul-ated tank	P. G. and E. Co.	Switch completely wrecked, one switch cell also wrecked by fire	Switch too small
60 kv., No. 8, Cordelia	4-break in insul-ated tank	P. G. and E. Co.	Switch failed on short, broke foot insulators, control rods and tops	Switch too small
60 kv., No. 10, Cordelia	4-break in insul-ated tank	P. G. and E. Co.	Switch failed on short, broke top, control rods and insulators	Switch too small
11 kv., No. 80, North Tower	Type F, Form K-12	G. E. Co.	Poor contact in jaws on one leg caused arc	
6.6 kv., No. 2 Gen., Drum P. H.	H 6	G. E. Co.	Switch broke down and caught fire when separating generator, which was out of step	
500 kv., No. 3 Gen., Alta P. H.	1,000 amp		Switch began to smoke after carrying 1,100 amp. for 12 hours	
4 kv., No. 139303, Sta. I, Oakland	330-amp, Type F., Form K, 7,500 volt	G. E. Co.	Switch blew up on short, can blown off, bushings broken and contacts burned	
11 kv.,Cal.-Hawaiian Sugar Co., Crockett			Bushing broken and leads burned off, shorted by rat	
11 kv., Concord-Pacheco Circuit		P. E. M. Co.	Strain insulator broke down	Due to short on 60-kv. line at Banta
60 kv., No. 70, Manteca	2-break, grd. tank	P. E. M. Co.	Switch blew up and caught fire	
104 kv., No. 102, Manteca	4-break, grd. tank	P. E. M. Co.	Rotating element fell off pin	
4 kv., No. 4 Gen., Stanislaus	H 3	G. E. Co.	Switch blew up, A-phase tank demolished and contacts badly burned	It is assumed that switch did complete opening stroke or pumped back to closed position on A-phase only
60 kv., No. 60, Manteca	2-break, grd. tank	P. E. M. Co.	Bushing punctured and grounded B-phase when switch opened on short	
60 kv., No. 20, Pt. Marion	2-break, grd. tank	P. E. M. Co.	Burning oil was thrown out of all three tanks, switch badly damaged	Switch tripped on severe short grd. switch was closed on line by mistake
6.6 kv., River sub	6.6-kv. oil switch.		Switch handle latch would not hold	
60 kv., No. 2, Inskip P. H.	2-break, grd. tank	Nor. Cal.	Rust prevented operating rod from closing switch properly	
60 kv., No. 4			Casting broke on operating lever, one bush-ing broke down	
6.6 kv., No. 74, Coleman P. H.			Closing solenoid shorted	
60 kv., No. 20, Cottonwood			Arched supporting casting cracked	
60 kv., No. 2, Kennett	2-break, grd. tank	Nor. Cal.	Center bushing on one phase loose on re-volving pin	
60 kv., No. 20, Cottonwood			Control lever casting broken	
60 kv., Inskip-Kelman	Oil Switch		Insulator on bottom of switch holding blades became loose	
Tertiary Sw., Williams			Adjustment slipped	
4 kv., No. 4 Circuit, Hammonton			Short on line caused switch to kick-out and throw a small amount of oil	Switch not damaged
11 kv., No. 900, E. Nicholaus	FKO-37, 400-amp. 1,500-volt	G. E. Co.	Switch started an arc when testing a shorted line	Minor repairs were made to switch

by a ¼-hp. motor of either 125 volts a.c., 125 volts d.c., or 24 volts d.c. It simultaneously winds two springs, one for closing and one for opening. Approximately 7 seconds is required to rewind after tripping.

One of these mechanisms tested on a 60-kv. switch opened and closed the switch over 5,000 times without a failure and without damage to either switch or mechanism. Some of the points in which this mechanism differs from the present switch control are:

(1) The mechanism locks the switch in either the open or closed position by a toggle mechanism which is positive and automatic.

(2) The moving parts of the switch have approximately an harmonic motion in closing by which the final closing effect is slow but very powerful on account of the change in effective lever arms.

(3) The opening action starts very fast and is gradually damped by the action on the closing spring.

(4) The springs both are positively wound by the motor and have sufficient stored energy to operate the switch without help from the motor.

(5) After the switch is closed the tripping spring remains stretched ready to operate the mechanism instantly upon the breaking of toggle. No additional time is required for rewinding or for motor operation.

(6) No combination of tripping operation can damage the mechanism. (Some mechanisms require a certain prescribed schedule of operation or they lock halfway open.)

(7) It can be built in any capacity desired, using a longer winding time and the same motor or a larger motor and the same time.

For several years there has been a growing demand for the use of the same oil for transformers and oil-circuit breakers.

One of the larger manufacturers has expressed willingness to use transformer oil where freezing weather does not occur. (Copley, Westinghouse.) The other large manufacturer still insists upon a specific oil-switch oil.

General

It is believed that oil-circuit breakers today are the limiting equipment on high-tension transmission systems and that the best type at present available have too heavy moving parts and open too slowly. (The 220-kv. breakers open in about 30 cycles.)

During the year 1924 the Pacific Gas and Electric Company had approximately 22 major cases of oil-circuit breaker trouble due to failure or defects in breakers themselves. This does not include minor mechanical difficulties, damage by lightning or by arcs started from causes exterior to the breaker or other cases of trouble for which the breaker itself could not justly be blamed. These 22 cases may be classified as follows, according to circuit voltages:

220 kv.— 0.
110 kv.— 1.
60 kv.—14.
11 kv.— 5.
6.6 kv.— 0.
4 kv.— 2.

A complete list of major troubles involving oil-circuit breakers during the year 1924 is given in Table I.

The Relation of Various Distribution Transformer Primary Voltages *

ATTENTION is directed to the anomalous relation of the primary voltages of distribution transformers for use on 11-kv. circuits, namely 11,500 to 115-230 volts and 6,900 to 115-230 volts for connection in delta and star respectively. The ratio of the primary voltages is 1.67 instead of 1.73. Therefore it is necessary to determine the primary line-voltage to suit the 11-kv. transformer and connect the 6.9-kv. transformer on the 6.6-kv. tap in order to deliver satisfactory secondary voltage to all consumers. This entails a sacrifice of about 4.5 per cent of the transformer winding.

This situation should be rectified by providing a transformer rated at 6,647 to 115-230 volts (a rating of 6,600 volts would introduce an error of only 0.75 per cent, favorable to the consumer).

The same sort of anomaly formerly existed relative to transformers used on 4-kv. circuits and was remedied by the production of a transformer rated 4,000 to 115-230 volts in place of 4,400 to 122-244 volts.

Cooling

At the Columbia Steel substation of the Pacific Gas and Electric Company the water-cooled transformers are supplied with water from the Sacramento River at Pittsburg, Calif. Due to the extreme low water of last year, this water became salty for the first time within our experience and leaks developed around the brazed joints of the copper cooling-coils due to the resulting electrolytic action. The brazed joints were cut out and welded-copper joints made, resulting in a complete solution of the difficulty. This was the first time welded copper joints have been used by the company in transformer cooling-coils.

During the early part of 1925 the second installation of a circulating-oil, transformer-cooling system was made on the system when this means of cooling was applied to four 400-kv. transformers at the Pittsburg substation. This is an old installation and does not involve any features of particular note except that a separate oil pump and external cooling-coil is provided for each transformer. The oil is forced through the cooling coils which are located immediately in the rear of the building where cooling water from the river is caused to flow over them.

By use of this unit-system bad oil in one transformer cannot affect the oil in the remaining transformers.

* System of Pacific Gas and Electric Company.

Frequency Changer Operation

By L. L. DYER and E. R. STAUFFACHER

DURING the period from Jan. 1, 1924, to Dec. 1, 1924, the operation of frequency changer sets as ties between the fifty-cycle system of the Southern California Edison Company and the sixty-cycle systems of the various companies with which power was interchanged was very successful and presents some very interesting information which is shown in Table I.

Location	Capacity	Hours Run	Hours Available but not run	Out of Service Hours
Vestal substation	15,000 kva.	7,819	53	168
Capistrano substation	5,000 kva.	5,044	2866	297
Colton substation	5,000 kva.	1,540	6247	251
L. A. No. 3 substation	5,000-kva.	3,265	905	12

Maintenance Work

Vestal frequency changer was taken off after 108 days continuous run to work on the rotor bars. Off 6 days, 8 hours. After 43 days additional service it was shut down to change the transformer taps. Bearing trouble developed 150 days later necessitating an out-of-service period of 8 hours. The cause of trouble was a loose exciter coupling which allowed the bearing to vibrate. Bearing trouble recurred after 16 more days, causing a 16-hour outage to scrape the bearing.

Capistrano machine end-bells were taken off for the regular semi-annual inspection. Two bars were found broken off. These were replaced and the machine cleaned.

Colton machine end-bells were taken off for the regular semi-annual inspection. Starting bars were brazed to the ring and the machine cleaned.

L. A. No. 3 machine was out of service for 12 hours due to bearing trouble.

Power Interchange in San Joaquin Valley in 1924

By R. D. LIKELY

AS an introduction it may be well to give a brief description of the San Joaquin system in order to make clear the relations of the different points of interconnection to the points of supply and load.

The simplified diagram in Fig. 1 shows only such parts of the system as are concerned with the possible transfer of power to or from other companies. The weight of lines in this sketch shows roughly the relative importance of the different power lines. All lines are 70 kv. except as subsequently noted. The heavy

line through the center of the system is 110 kv., 266,800 circ. mil aluminum. The loop superimposed upon this line is 1/0 copper or equivalent aluminum. Cross connections with the 110-kv. line are 3/0 copper or equivalent aluminum. The change from one voltage to another is made by means of 5,000 kv. auto transformers. Installed transformer capacities at these substations are as follows:

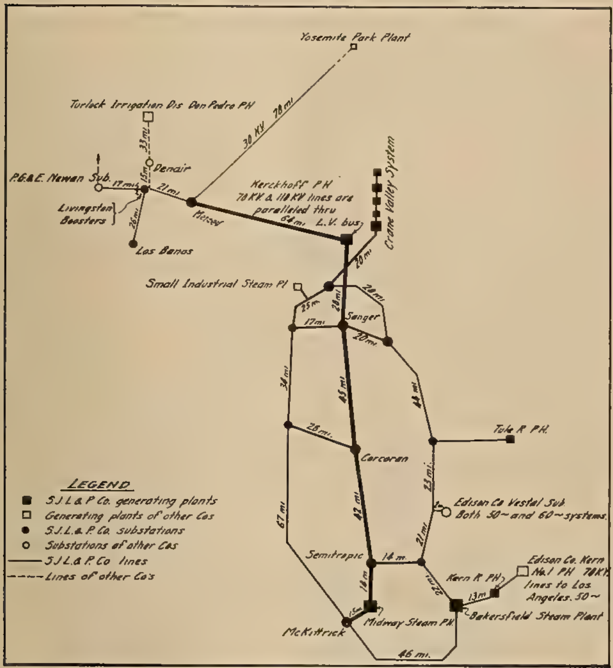


Fig. 1.—Arrangement of principal lines involved in interconnections with San Joaquin Light & Power Corporation in 1924, after construction of Turlock line.

Sanger	30,000 kva.
Corcoran	15,000 kva.
Semitropic	15,000 kva.
McKittrick	15,000 kva.
Merced	15,000 kva.

These transformers also are equipped with tertiary and 11-kv. windings. The latter serve local loads which are fairly heavy at all these points. The other substations shown also are fairly important load centers and switching stations on the transmission system.

The line from Kerckhoff to Merced is of 110-kv. construction with 266,800-circ. mil aluminum, but during the time under discussion was operated at 70 kv. to permit connecting to it certain 70-kv. substations in order to obtain better voltage regulation at these points. This was accomplished by a delta-delta connection of the transformers at Kerckhoff power house. These transformers, which have a nominal high tension rating of 63,500-110,000 volts Y, are operated at slightly over voltage giving approximately 70 kv. delta.

The lines from Livingston to Newman, and from Livingston to Merced are No. 2 copper. From the Turlock Irrigation District's substation to the Livingston substation is 3/0 copper and from the Don Pedro plant to the Irrigation District's substation is 3/0 aluminum.

The principal plants feeding the San Joaquin system are as follows:

Crane Valley system, 5 plants operating principally from stored water and with a peak capacity of 26,000 kw.

Kerchoff, operating principally on stream flow and partly on storage, with a large forebay for fluctuation on daily peaks; peak capacity 38,000 kw.

Tule, operating on stream flow exclusively with no possible fluctuation on the peaks; maximum capacity 5,000 kw.

Kern Canyon, operating on stream flow exclusively with no possible fluctuation on the peaks; maximum capacity 10,000 kw.

Midway Steam Plant, 25,000 kw.

Bakersfield Steam Plant, 25,000 kw.

Description of Interconnections with Other Companies

Points of interconnection with other companies as they existed in 1924 are as follows:

(1) With the Edison company at Vestal—The San Joaquin system which is 60 cycle, is connected at Vestal to the Edison company's Mt. Whitney system which also is 60 cycle. This is shown in Fig. 1. The Edison company's Mt. Whitney system is connected to its main system, which is 50 cycle, through a 15,000-kva. frequency-changer set. The amount of power which may be exchanged depends upon the load on the Mt. Whitney system and upon the output of the small 60-cycle plants on that system. The capacity of the interconnection may be taken as roughly 20,000 kw.

(2) With the Edison company at Kern Canyon power house—The San Joaquin company has a stream-flow hydro plant of 10,000 kw. in one unit on the Kern River, about 12 miles from Bakersfield. The Edison company has a 20,000-kw. stream flow plant in four units a few miles farther up the same river. Power from the Edison company's plant is transmitted to Los Angeles over 70-kv. lines. These two plants are connected by a 70-kv. line and when it is desired, the San Joaquin company's Kern plant may be operated at 50 cycles on the Edison company's system or the Edison company's plant may be operated at 60 cycles on the San Joaquin system. The capacity of this connection depends upon the water available so that the possible exchange varies from a few hundred to 10,000 kw. In emergencies, a 12,500-kw. unit at the Bakersfield steam plant has been operated at 50 cycles. The manufacturer of the unit recommended that the load at 50 cycles not be above 9,000 kw. and estimated that the fuel consumption would be increased about 10 per cent. No trouble was experienced on the few occasions that this was done. This power was delivered over the line from the steam plant to the Kern River plant as shown in Fig. 1, thence to the Edison company. Of course when this is done, the Kern plant also is operated at 50 cycles.

(3) With the Pacific Gas and Electric Company at Newman—Prior to 1924 considerable quantities of power were delivered to the Pacific Gas and Electric Company at Newman over the Kerckhoff-Merced 110-kv. line by operating one unit at Kerckhoff together with the Merced and Livingston substations separately from the remainder of the San Joaquin system. This was necessary due to the comparatively small lines and transformers which do not permit the two systems to be operated in parallel although both are 60 cycles.

There is roughly 75 miles of No. 2 copper, 60-kv. line between the Merced and the Pacific Gas substation at Manteca a point about 35 miles north of Newman, at which the power is delivered to the Sierras-San Francisco 104-kv. system. Due to this fact there was a heavy voltage drop in this line. However, for power delivery to the Pacific Gas and Electric Company, operation without boosters was satisfactory because the normal voltage of the San Joaquin system is actually 70 kv., while that of the Pacific Gas and Electric Company is about 60 kv. The latter company maintained the power factor very nearly at unity.

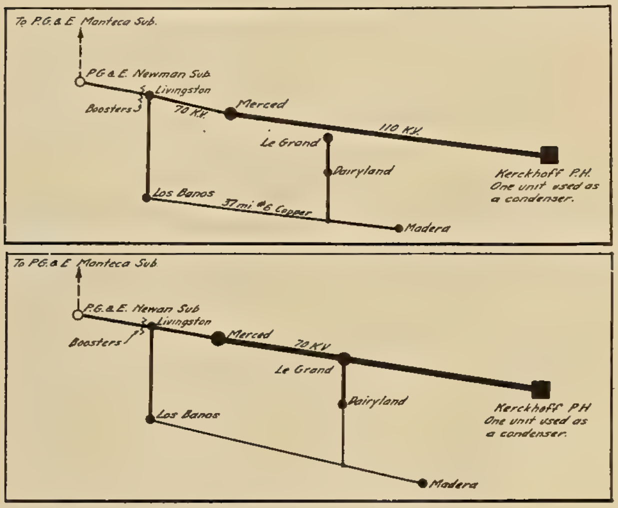
In 1924 it was desired to transmit power only from the Pacific Gas and Electric Company to the San Joaquin company in order that an equivalent amount might be delivered by the latter company to the Southern California Edison Company. The only way in which this could be done was to connect certain San Joaquin substations to the system of the northern company and separate them from the San Joaquin system. This first was done in March when the shortage in the southern part of the state began to be acute.

Owing to the difference in the voltage of the systems and the excessive line drop, boosters were installed at Livingston to raise the voltage approximately 20 per cent. These boosters were standard substation transformers rated 667 kva., 40,000 to 6,680 volts and with high-tension taps down to 36 kv. By using this lowest high-tension tap, connecting the transformers to give cumulative boost and mounting the transformers on insulated platforms the boost of approximately 20 per cent was obtained. Even then it was impossible to obtain high enough voltage unless a leading power factor was maintained.

At first, six substations were connected to the Pacific Gas system as shown in Fig. 2. This transferred a peak load of about 5,000 kw.. It was possible then to operate the Merced-Kerckhoff 110-kv. line at 110 kv., closing it in at Merced and leaving it open at Kerchoff. The addition of the approximately 5,000 kva. charging current of this line was sufficient to maintain the

power factor at Livingston at roughly .85 leading. This brought the voltage about as high as desired. At times of light load it was necessary to drop the Merced-Kerckhoff lines and at other times it was necessary to use a unit of Kerckhoff as a synchronous condenser to reduce the voltage.

As the load on these substations increased due to the growing irrigation load, the voltage again became too low for satisfactory service. At this time the Kerkhoff-Merced line was changed to operate at 70 kv. as explained previously. See Fig. 3. LeGrand, Dairyland and Madera substations temporarily were connected to the Merced-Kerckhoff line. This was possible owing to the fact that LeGrand had been chosen as the location of a proposed future 110-kv. substation and



Figs. 2 and 3.—Above is shown original arrangements of lines concerned with power purchase from Pacific Gas and Electric Company before construction of Turlock line. Below is later arrangement of same lines also before construction of Turlock line.

the transformers and lines at that point were located with this in mind. With this arrangement it was possible to handle slightly more load on the Pacific Gas system by using one unit at Kerckhoff power house as a synchronous condenser to regulate voltage at the receiving end. The maximum load so delivered was approximately 8,000 kw.

Losses incurred during this time were excessive, but were endured because of the urgent need for additional power in the southern part of the state.

After connection was made with the Turlock Irrigation District it was impossible to operate in the manner described. Only two substations, Livingston and Los Banos could be separated from the San Joaquin system and connected with the northern system. By this time the only power which the Pacific Gas and Electric Company had available for sale was that received by that company from the Alameda steam plant through the Great Western system. Fig. 1 shows the arrangement of lines after the Turlock line was built.

(4) With the Turlock Irrigation District at Livingston—During April a long-term contract was signed with the Turlock Irrigation District for the construction of about 15 miles of 70-kv. line from the district's Denair substation to Livingston and for the delivery of power over this line. The Don Pedro plant, which has a capacity of 15,000 kw. at the minimum head and approximately 18,000 kw. at higher heads, is owned jointly by the Turlock and the Modesto Irrigation Districts, the former being entitled to roughly 66 per cent of the plant output. There already was a line from this power house to the Pacific Gas and Electric Company's substation at Modesto by which the latter company received under contract a small part of the output of the plant.

During the construction of the line to Livingston, additional power was delivered to the Pacific Gas and Electric Company over that line.

Also after completion of the line a certain amount of energy was delivered to that company although the San Joaquin company had contracted for all of the Turlock share of the plant above the district's own need. The reason for this was the fact that it was impossible to parallel the two power companies' systems and the output of one unit of the Turlock plant was greater than the combined loads of the Turlock and Modesto systems plus the contract delivery to the Pacific Gas and Electric Company mentioned above. Thus there still was some surplus power which otherwise would have been wasted during the time when it was necessary to release water for irrigation, above the capacity of the plant.

Fig. 4 shows the arrangement of the Turlock lines to get maximum delivery to the San Joaquin company. This amounted to about 11,000 kw. Not all of this would have been available had not a temporary agreement been made with the Modesto Irrigation District for its part of the surplus. The maximum received from Turlock alone was about 8,000 kw. The scheme shown had the disadvantage that in case of trouble on the line supplying the Turlock and Modesto substations it was impossible to switch their load to the line supplying the San Joaquin company owing to the difference in the voltages at which these lines were operated. To make it possible to obtain this additional protection a three-phase auto transformer was installed on the Pacific Gas and Electric Company line at Don Pedro power house so that this line may be operated at 60 kv. while all the other lines are operated at 70 kv. The rating of this auto transformer is 2,500 kva., 73 to 59 kv. with five 2.5 per cent taps on the 70-kv. side so that with 73 kv. impressed on the primary secondary voltage from 59 kv. to 63 kv. may be obtained.

(5) With an Industrial Plant near Fresno—There is an industrial steam plant near Fresno of 3,750 kv. installed capacity of which from 2,000 to 3,000 kw. was available for sale. The inter-connection consisted of three 1,000-kv. 66-kv. to 2.3-kv. transformers and about one-half mile of 70-kv. line as shown in Fig. 1.

(6) With a Lumber Company at Merced Falls—A lumber company has a steam plant of about 500 kw. at its mill near Merced Falls. Its surplus output amounted to about 200 kw. and was delivered over a short 2.3-kv. feeder to the San Joaquin company at its Merced Falls power house.

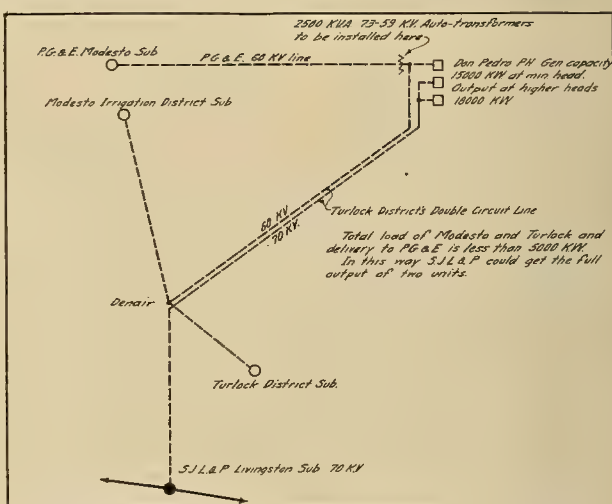


Fig. 4.—Arrangement of Turlock Irrigation District lines for power delivery from Turlock to San Joaquin Light & Power Corporation in 1924.

(7) With the Yosemite Valley power house of the Department of the Interior—The Department of the Interior operates a 2,000-kw. steam-flow hydro plant on the Merced River about six miles from El Portal. The San Joaquin company extended its 30-kv. line from its Incline sub near El Portal about ten miles up the Merced River to the park plant. The total length of the 30-kv. line from the Merced substation to this plant is about 78 miles. The agreement with the Department of the Interior provides for the sale of the surplus output of the plant to the power company and also for the purchase of energy by the park at times of low water.

General Remarks

Comparatively little trouble has been due to these interconnections. At the substations connected to the Pacific Gas and Electric Company's system there was some trouble from poor voltage regulation due to the long lines of both companies over which the purchased

power was received, but due to the emergency this was overlooked.

With the Turlock plant there was no difficulty so far as the San Joaquin was concerned. They simply carried block loads as required by San Joaquin dispatchers except as the district's demands for water for irrigation modified the operation of the plant. The irrigation requirements took precedence over the generation of the plant, but very little conflict resulted from this cause and practically all of the possible output of the Turlock plant was absorbed. The cooperation of the irrigation district's officials and operating men was excellent and thoroughly appreciated by the San Joaquin company.

TABLE I.—Energy in kw-hr. transmitted through various interconnections with the San Joaquin Light & Power Corporation—1924.

Month	S.J.L.& P. to So. Cal. Ed. at Vestal	S.J.L.& P. to So. Cal. Ed. at Kern	P.G.and E. to S.J.L.& P. at Newman including Alameda Steam	Turlock to S.J.L.& P. at Livingston	Turlock to P.G. and E. on S.J. L.& P. contract	Industrial steam to S.J.L.& F.
Jan.	11,259,000	179,000	0	0	0	0
Feb.	9,245,800	1,551,000	804,000	0	0	0
March	8,811,000	2,772,000	2,641,000	0	0	0
April	6,880,000	978,000	363,000	1,171,000	572,000	0
May	0	0	0	1,939,000	2,210,000	0
June	2,227,000	0	0	6,259,000	475,000	0
July	1,388,000	0	0	8,335,000	718,000	1,007,000
August	8,755,000	0	297,000	7,622,000	476,000	1,661,000
Sept.	7,643,000	0	430,000	2,555,000	0	1,761,000
Oct.	7,330,000	0	445,000	1,738,000	0	1,306,000
10 months total	63,538,000	5,480,000	4,980,000	29,619,000	4,451,000	5,735,000

When delivering power to the Edison company the two systems usually are in parallel and the San Joaquin system is operated with block loads which are changed from time to time at the request of the Edison company's operator at Vestal. Occasionally when the frenquency-changer set was out of service, the San Joaquin company carried most of the load on the Mt. Whitney system and governed its own and the Mt. Whitney systems. During the months of heaviest load it was necessary to be careful that the San Joaquin system did not receive an undue amount of reactive kva. from the Mt. Whitney system. On a few occasions during this period sufficient reactive kva. was received by the San Joaquin system to reduce the voltage of the entire system so much that satisfactory service could not be maintained. Upon taking up the matter with the Edison company's operator at Vestal the necessary adjustments were made on the frequency-changer set and other synchronous machinery on the Mt. Whitney system to restore the voltage of the San Joaquin system to normal.

In this connection it may be noted that while frequency-changer sets for the interconnection of two systems are expensive in themselves and also cause considerable power loss, they may not be necessarily an entire waste as they may be useful to take the place of synchronous condensers on one or both of the systems so connected.

Table I shows the amount of power transferred between the various companies.

In general, relations between the various parties to these interconnection agreements have been very harmonious and practically everything possible was done to deliver the maximum amount of energy to the southern part of the state.

Distribution Transformer Ratios

By H. H. MINOR

THE company has experienced some difficulty in the use of 11-kv. and 6.9-kv. distribution transformers. It is the company practice to use 11.5 kv. to 115-230-volt transformers for isolated single-phase loads and 11.50-kv. transformers for large three-phase installations. The standard voltage ratings are respectively 11.5 kv. to 115-230, 11.5-kv. to 230-460-575 and 11 kv. to 2,300-4,000 Y for transformers to handle this class of business.

For smaller three-phase installations and for small combined three-phase and single-phase installations 6.9-kv. class transformers connected Y-delta are used. Their standard ratio is 6,900-11,950 Y to 115-230 volts.

Thus it is possible to have the following condition on four plants served from the same 11-kv. line, assuming the primary voltage to be 11.5 kv. in each case and all transformers connected on full primary winding and disregarding transformer regulation:

(1) A single-phase load served by an 11.5-kv. transformer; secondary voltage 230.

(2) A large power consumer served by 11.5 kv. to 230-volt transformers; secondary voltage 230.

(3) A large power consumer served by 11-kv. to 23-kv. transformer; secondary voltage 2,404.

(4) A small power consumer served by 6.9-kv. transformers; secondary voltage 221.5.

Cases 1, 2, and 4 are very common with the company who are confronted with using the 5 per cent tap on 6.9-kv. transformers universally in order to equalize their secondary voltages with those of the 11.5-kv. transformers. This makes the full winding connection of the 6.9-kv. class unnecessary. The above condition is one which feeder regulators will not correct.

The question is taken care of partially in the Electric Power Club Standards by the adoption of 6.3-kv., 6.0-kv. and 5.7-kv. taps for 6.6-kv. transformers with secondary voltage below 600. However, there are many transformers without this 5.7-kv. tap.

Case 3 is met with to disadvantage when lighting load is served from large power banks through 2.3-kv. transformers, particularly during periods when the power service is not being used and transformer regulation does not help out. This same condition also occurs in small 11-kv. to 2-kv. substations. Feeder regulation will help in this latter case, but results in the regulators always working on the "buck" and they must have a greater range than would be necessary were the ratio of the large power transformers more nearly like the distribution transformers.

It is the tendency to operate so-called 11-kv. lines at about 12 kv. at the substation bus, or even higher in some instances. This agrees perfectly with the 6,900-11,950 Y rating of the 6.6-kv. class transformers. It would seem then, to be the logical step to make the 11-kv. class agree by adding a 5 per cent higher tap, i.e., making them 12,075-11,500-10,925-10,350 to 114-230, etc. Thus the two classes of transformers would be in agreement throughout and the 11-kv. class, or 12-kv. class, as it would have been, would be rated at more nearly the voltage at which it is used and insulations, losses and other items would be figured for that voltage.

For power transformers supplying 600 volts and below it would be well to make them as follows:

12,075-11,790-11,500-11,215-10,925 to 230-115, etc., thus maintaining the present standard of four 2½ per cent taps. For power transformers supplying secondary voltage greater than 600 volts a desirable change would be to make the ratio as follows:

11,825-11,550-11,275-11,000-10,725 to 2,300-4,000 Y. In both of the above cases taps would be available so that transformers manufactured under these specifications could be banked with or paralleled with the present standard transformers.

Considering the same four cases as above with transformers of the ratio suggested the following secondary voltages would result, the primary voltage being maintained at 11.5 kv. in each case.

(1) A single-phase load served by a 12,075 to 230-volt transformer; secondary voltage 219.

(2) A large power consumer served by 12,075 to 230-volt transformers; secondary voltage 219.

(3) A large power consumer served by a 11,825 to 2,300-4,000 Y bank; secondary voltage 2,237.

(4) A small power consumer served by 6,900 to 230-volt transformer; secondary voltage 221.5.

Pacific Gas and Electric Company Power Interchange

By H. T. SUTCLIFFE and B. D. DEXTER

THE various points of interchange between the Pacific Gas and Electric Company and other utilities as of March 1, 1925, are shown in Table I, together with the voltage and capacity of connections and generally pertinent data. The numbers in parentheses in the second column refer to corresponding numbers on the high-tension system map shown in Fig. 1. The letters in column three indicate the limiting factor in de-

livery at the various interchange points and show whether the limitations are based upon generator, transformer or line capacity.

Although at a few of our interchange points step-up or step-down banks are provided to compensate for slight differences in line voltages of the connecting companies, these voltage adjustments are fixed. There is but one connection where regulation is provided and this is the connection made with the system of the Truckee River Powei Company. A brief description of this interconnection is of interest.

The main generating capacity of the Truckee River Power Company comprises five hydro plants, four of which step up to an interconnecting network of 23 kv. This voltage is stepped up at their Washoe plant through a delta-delta bank to 63 kv. and their Verdi plant output is stepped up to 63 kv. to tie into this high-tension bus. The interconnecting line from Spaulding No. 1 power house of the Pacific Gas and Electric Company ties into this 63-kv. bus through the regulating equipment to be described. The system of the latter company is grounded Y and the Truckee River system is con-

TABLE I.—Interchange points on system of Pacific Gas and Electric Company

Connecting utility	Point of connection†	Capacity in kw.*	Voltage in kv.
Calif.-Oregon Pwr. Co............	(1) Delta......	12,000 L	60
City & County of San Francisco....	(2) Priests.....	3,000 G	17
Coast Counties Gas & Elec. Co.....	(3) Davenport.	2,250 T	22
	(4) Morgan Hill	3,000 T	22
	(5) San Juan	3,000 T	22 & 4
Coast Valleys Gas & Elec. Co.....	(6) Salinas	5,000 T	60
	(7) Alisal	5,000 T	60
Great Western Pwr. Co...........	(8) Oakland	5,000 T	11
	(9) Oakland	15,000 T	60
	(10) San Francisco	7,000 L	11
Melones Mining Co..............	(11) Jeffersonville	1,000 G	17
Modesto—Turlock Irrig. Districts..	(12) Don Pedro	4,000 T	60
San Joaquin Lt. & Pwr. Corp......	(13) Newman	12,000 L	60
Snow Mountain Water & Pwr. Co...	(14) Santa Rosa	5,000 G	60
Truckee River Pwr. Co...........	(15) Summit	8,000 L	‡60
Western States Gas & Elec. Co....	(16) Stockton	15,000 T	60
	(17) Manteca	2,250 T	30
	(18) Junction City	2,000 L	60

*Letters signify the limiting factor in delivery, either generator, transformer or lines.
†Figures refer to Fig. 1.
‡Regulated.

nected delta at this point. The metering point for this interchange is located at the summit of the Sierra Nevada Mountains approximately 18 miles from Spaulding and 49 miles from Washoe.

The voltage on the system at Spaulding is approximately 60 kv. and allowing for a voltage drop of 52 kv. at 5,000 kva. it is necessary for the regulating equipment at Washoe to boost upon delivery from the Pacific Gas & Electric Company system to the Truckee River system from a low voltage of 54.8 to 63-kv. This same equipment will boost upon delivery in the reverse direction from 63 kv. on their bus to a maximum of 67 kv.

When the regulating equipment first was contemplated, consideration was given to straight automatic induction voltage regulation similar to the type commonly used for feeder regulation. The cost of this equipment was found to be so excessive that the installation finally was made with shunt and series transformers taking the place respectively of the primary and secondary of an induction regulator. The winding of the three-phase series transformer which is connected in the line has a normal operating capacity of 79 amperes which at 63 kv. between wires provides for an interchange of approximately 8,500 kw.

The series boosting or bucking transformer is excited by means of three single phase shunt transformers the secondaries of which are provided with taps so that step-by-step regulation may be obtained. Five steps are used each providing a buck or boost in the main line of approximately 1,640 volts. All five of these taps may be used for delivery to Truckee River but on reverse delivery not more than three normally are used.

Taps in the low-voltage side of the shunt transformers are changed by means of contactors operated by cams mounted on a shaft which is connected to a motor. The motor is energized through the operation of a contact-making voltmeter in a manner similar to the operation of an ordinary induction voltage regulator. Limiting resistors are provided between these contactors to absorb the energy from the section of the transformer winding between two adjacent taps shorted during the interval of cutover. The contact-making voltmeter responds only to variations in line voltage of approximately 1,000 volts between wires. A line drop compensator is included in the circuit for power delivery from Truckee River to Pacific Gas and Electric Company in order to compensate for voltage drop in the 67 miles of line, but is not included in the circuit for delivery to Truckee River.

The position of the contactors is indicated by means of a lamp indicator system so that the operator at all times can tell upon which tap the regulator is operating.

Fig. 1—Showing points of power interchange on system of Pacific Gas and Electric Company. Circled figures those in column two in Table I.

The cams operating the contactors are arranged to positively open the latter in case one of them should freeze shut. In other words cams are normally opened by springs in the usual manner, but in case excessive current should cause one of them to freeze, the cam will follow up the spring's action and force the contactor open.

Under short-circuit conditions where an excessively high current is drawn through the series transformer windings connected in the main line, voltage relays on the other windings of this transformer operate to short circuit through a resistor what is then the secondary. This resistor also shorts the secondaries of the shunt transformers. The series transformer is so designed thath the iron reaches its saturation point at a voltage of 2.5 times its normal voltage. This prevents the building up of excessive voltages and consequent damage to the equipment in the case of short circuits on the main line.

Relays and Relay Application

By R. C. DENNY

IN the matter of protective relays there have been in the past year no applications of an entirely new nature on the system of the San Joaquin Light & Power Corporation. The transmission line switches, howover, practically all have now been equipped with the modern induction-type relay. Where the switches

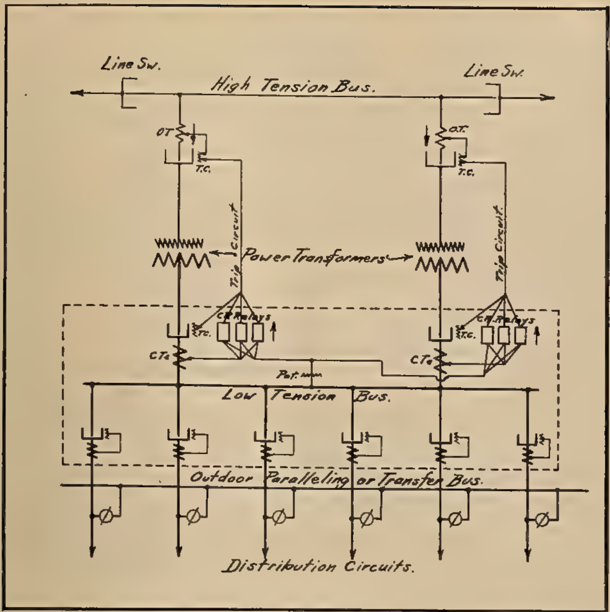


Fig. 1.—Showing scheme of transformer protection for 2-bank substations.

may be part of a loop and a two-way feed involved, the directional induction-type overload relay is used while in the case of stub lines the straight induction-type overload relay is used. In general the operation of these relays has resulted in greatly improved system operation and more nearly continuous service. Experience has demonstrated, however, that the proper selective action of such relays to a large extent is dependent upon the proper functioning of the switches themselves. Very often switches that are inherently sluggish will upset the best-laid plan of relay operation. Occasionally defects of a minor nature in the auxiliary circuits will prevent otherwise proper operations. It would seem therefore that successful relay operation is tied in quite definitely with switch maintenance of a very high order.

There has been an installation of low-energy overload relays for the differential protection of four 4,000-kw. generators in one of the older, but still important hydro plants. A scheme of protection, shown in Fig. 1, uses one bank against another and has been applied in substations where there are two or more banks of transformers. This is equivalent to differential protection yet requires neither high-voltage nor bushing-type current transformers. This scheme is accomplished simply by connecting on the low-tension leads a group of directional relays set to close contacts when power flows back into the transformer bank and which in operating open both the high- and low-tension transformer switches, thereby dropping the bank. Ordinary series overload protection may be applied on the high side in such cases.

Short Circuit Duty on Kelman Switches at Laguna Bell Station

By E. R. STAUFFACHER

A HEAVY short circuit duty was imposed upon one of the Kelman 60-kv., type-3 D6 switches located at Laguna Bell substation on Feb. 10, 1925, at 11:12 p.m. A 60-kv. short circuit occurred on the Santa Fe Springs circuit about six miles out of Laguna Bell substation. The 60-kv. switches at Laguna Bell and Santa Fe Springs substations cleared the short circuit and calculations indicate that the duty imposed upon the switch at Laguna Bell substation was as follows:

	Kva. Interrupted	Amp. at 63 Kv.
Actual duty, 0.7 Sec. elapsed between the time the short circuit started and the time the switch opened	394,000	3,600
Relay set at 0.4 Sec.		
Instantaneous duty possible under these conditions	550,000	5,060

The station crew reported that only a slight amount of oil was thrown from the switch. From the above table it would appear that 500,000 kva. would be a conservative rating for this particular type of switch.

New Types of Protective Relays

By H. T. SUTCLIFFE, R. W. WILKINS and H. S. LANE

THE report is submitted categorically in accordance with the outline furnished by the chairman of the apparatus bureau. Under the headings (a) New Types of Relays for Protection of Transmission Network, and (b) New Types of Relays for the Protection of Internal Trouble in Equipment, extracts are submitted from a report covering an investigation by the bureau of tests of the Pacific Gas and Electric Company of two relays manufactured by the Swedish General Electric Company, Ltd., namely:

Type RI inverse time-element over-current relay.

Type RIK definite minimum time-element over-current relay.

Construction and Operation

These relays are for use with alternating current of 60-cycle frequency. Both relays operate on the induction principle. An aluminum disc is caused to rotate continuously by the interaction between a flux from the electromagnet and an out-of-phase set up by a shading coil on the pole piece of the electromagnet. A permanent magnet acts as a damper. This disc ceases to rotate only when the current falls to less than approximately ten per cent of the normal current setting. The shaft of the rotating disc is pivoted vertically between the arms of a fork-shaped bracket. This bracket itself is pivoted on a vertical axis and is free to swing on that axis through a small angle. The weight of the disc is counterbalanced.

The lower disc-bearing consists of the rounded end of the disc shaft bearing upon a small steel ball which in turn is seated in a jewel. This ball is the same size as that used in Westinghouse meters, 63 mils in diameter. The upper bearing is a simple guide bearing.

With normal current conditions the disc rotates freely, but upon a sufficient increase of current the force rotating the disc also swings the fork-shaped bracket forward against the tension of a light spring. On the shaft of the disc is cut a worm gear which being thus carried forward is meshed into a toothed sector. Continuance of rotation of the disc rotates the sector to which is fastened an arm which in turn trips a normally magnetically-balanced armature, also excited by and a part of the main electromagnet. Tripping of this armature forces together, or can be made to open uo, the relay trip contacts.

The type RI has current settings for 4, 5, 6, 7, 8, 9 and 10 amperes and time settings variable from 3 to 16 seconds. The type RIK has current setting for 4, 5, 6, 7, 8, 9 and 10 amperes and time settings variable from 2 to 10 seconds.

For the type RI meter the time settings are the tripping times for 100 per cent current setting, whereas in the case of the type RIK meter the time settings are meant to be the definite-minimum-tripping times for from 400 per cent to 1,000 per cent current setting. The time is varied by changing the initial position of the toothed sector, thus changing its length of travel before it trips the armature.

The shading pole of the type RI is larger than that of the type RIK, the result being that its characteristic curves are not so flat as those for the type RIK which is meant to be a constant-time-limit relay at above four times normal current.

Once the current has risen sufficiently to mesh the toothed sector with the worm on the dial shaft, the tripping operation will be completed unless the current falls to approximately 80 per cent of the set value before this completion, in which case the mechanism resumes its normal position. This entirely prevents "floating."

The disc rotates slowly upon passage of a current of approximately 10 per cent of the current setting. This gives the operator a partial indication that the relay is in working order.

Other Features

The relays may be adjusted to operate instantaneously at 4, 6 or 8 times the ampere setting by turning a knurled nut to these inscribed marks. Other values could be found by calibration.

This knurled nut alters the condition of magnetic balance of the centrally pivoted armature by opening up one air gap and correspondingly closing the other. When the relay functions, one air gap is reduced to a close contact. By initially shortening this air gap the necessary amount, a given overcurrent will operate the trip without first meshing the disc-shaft worm with the toothed sector.

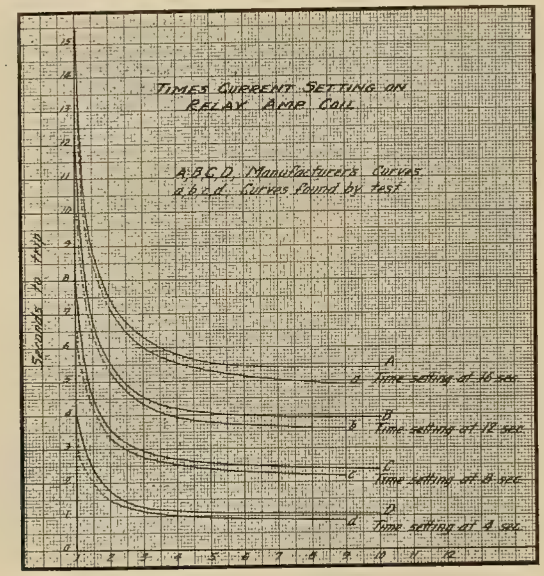


Fig. 1—Characteristic curves of type RI, time-element, overload relay manufactured by Swedish General Electric Company, Ltd.

The contacts easily are changed from circuit opening to circuit closing or vice versa.

The changes in current settings can be made while the relay is in service. All the current taps are brought out in a line to rectangular studs. A heavy hinged corrugated plate covers these studs in such a manner that by inserting a metal plug into a concavity between the plate and any desired stud, the circuit is completed for that particular current tap. Changing the current setting does not open the current circuit, for before the plug is totally withdrawn the hinged plate closes the circuit of the 10-amp. tap.

All connections are made from the back of the relay. Extra studs are supplied to suit thickness of the switchboard.

The weight of each relay is 6.7 lb. Its horizontal length is 9.2 in., its height 5.4 in., and its depth 5 in. The back of the relay is of cast alloy and the cover of brass. A hinged lid has a glass inset 4.2 in. by 3.4 in. in size, sufficiently large to show the name plate on which are drawn the characteristic curves of the relay and the figures representing the relay settings. The name plate of the type RI relay is black with white inscriptions, while that of the type RIK is white with black inscriptions.

Provision is made for sealing the lid closed. Nevertheless the whole cover can be taken off by the removal of four screws.

Tests Made

1. Characteristic curves of relays and repeating accuracy.
2. Speed of disc, free and driving sector.
3. Proportionality of time settings.
4. Resetting value of current as percentage of "pick-up" value.
5. Current required for rotation of disc.
6. Accuracy of calibrations for instantaneous trip.
7. Volt-ampere and watt loss.

Results

Test No. 1—These curves were obtained on the 4-amp. tap at different time settings with the instantaneous trip set at 40 amp. The tripping times were determined by use of a cycle counter.

The type RI relay required 4.2 amp. to mesh the sector, the type RIK required 4.54 amp.

The results are plotted as shown in Figs. 1 and 2, together with the manufacturer's curves.

Test No. 2—Type RI relay: Current on 4 amp. tap, 4.2 amp. Speed of disc, running free, 97 r.p.m. Speed of disc, driving sector, 87 r.p.m.

Test No. 3—Test made by passing 16 amp. through the 4-amp. coil and noting tripping time with each time setting. At the higher time settings the proportional time on both relays was quite accurate. At lower settings it was somewhat high on the RI relay and somewhat low on the RIK relay.

Test No. 4—The reset-value of current on the 4-amp. tap was 82 per cent of the pick-up current for the RI and 79 per cent for the RIK.

Test No. 5—The slowest speeds with which the discs rotate with certainty were effected with 16 per cent of pick-up current on the RI relay and 10 per cent on the RIK.

Test No. 6—The knurled nut was set at each of the calibration points indicating the multiplier of the current setting for instantaneous trip. Tests were made on each current setting. The points are approximate only and change with the different current settings. The ratio of actual to calibrated trip on the two relays varied from .79 to 1.47.

Test No. 7—Type RIK, amp. tap, 5; amp., 5; volt drop, 5.65; volt amp., 28.2; watts, 9.9; P. F., 0.35: Type RI, amp. tap, 5; amp., 5; volt drop, 1.41; volt amp., 7.05; watts, 3.7; P. F., 0.53.

Conclusions

These relays have many good features and though not calibrated very accurately their repeating accuracy is good. In particular should the instantaneous trips be re-calibrated.

As in the Westinghouse CO and the General Electric IA, no adjustment is provided which will change the shape of the characteristic curves.

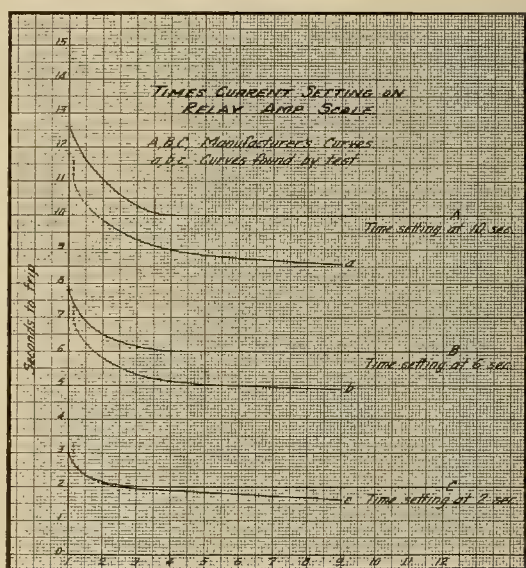


Fig. 2—Characteristic curves of type RIK, time-element, overload relay manufactured by Swedish General Electric Company, Ltd.

The curve sheets reproduced in the accompanying illustrations show that the characteristic curves of the two types at above 200 per cent current setting are very similar, hardly sufficient to justify the distinction between the type RI as an inverse-time overload relay and the type RIK as a definite-minimum overload relay The fact that the curves approach the horizontal at much less percentage overcurrent than do the curves for the Westinghouse standard type CO relay or the General Electric type IA-201 relay makes this relay valuable where such a characteristic is desirable.

The bearings are good. Yet without slight lubrication of the bottom bearing the disc chatters. A valuable feature is the continuous rotation of the disc even at 10 per cent of normal current settings. This gives a visible indication of its being prepared to function. "Floating" at the trip contacts cannot occur. Once the

tripping operation has commenced it must continue to completion or the mechanism reset to normal. The trip contacts can be made circuit opening or circuit closing. In either case the action is fast and definite. The current transformer secondary can not be opened accidentally while changing the current tap settings. Energy loss is 28.2 volt-amperes for type RIK and 7.0 volt-amperes for type RI.

For a comparison, the Westinghouse standard CO of the 4-12 amp. range has a loss of approximately 18 volt-amperes on the 5-amp. range and the low energy relay a loss of 7.4 volt-amperes. The General Electric type IA-201 has a loss of 7.6 volt-amperes on the 5-amp. range and the type IA-101 a loss of 7.1 volt-amperes.

The relay covers are not all that could be desired. They are cheaply made. The point of a pencil can scratch off the black enamel. To change relay settings the lid is opened on its hinge. The whole cover is easily removed to expose the relay mechanism. The lid can be sealed. The relay mechanism itself is well made.

Relay Protection as Applied to a Large Transmission Network

By R. W. WILKINS

THE practices of the Pacific Gas and Electric Company have been developed as the result of a number of years experience in the operation of this large system, and are designed to separate completely the smallest practicable section in such manner as to cause the least possible disturbance. The company's high-tension system comprises 28 hydroelectric plants, four steam plants, 412 miles of 220-kv. line (one-half of this now operating temporarily at 110 kv., 5.15 miles of 110-kv. line, 290 miles of 104-kv. line, 1,889 miles of 60-kv. line, and 160 miles of line at from 20 to 30 kv. The arrangement of this system is indicated on the accompanying map.

The standard generator connection is a grounded "Y" without resistance in the ground connection. Certain of the older generators are connected delta. In one case different characteristics of generators on the same bus made necessary the introduction of ground resistance.

Power-house transformers are connected delta-Y, with the high-tension neutral solidly grounded. Most of the receiving transformers are connected Y-delta with the high-tension neutral solidly grounded. There is on the system, however, an increasing number of auto-transformers Y-connected with the neutral solidly grounded at the substation ends of transmission lines, particularly at the higher voltages. In order to conform to the state ruling on inductive interference these have a third or tertiary winding connected in delta.

*This article appeared in the Nov. 22, 1924, issue of Electrical World.

Advantages of Relay System

There are several advantages to the system of relay protection which has been developed by the Pacific Gas and Electric Company.

(1) Single-phase grounds are removed very quickly with a high degree of selectivity.

(2) The system is applicable to single lengths in the transmission network as well as to one circuit of a pair of circuits or one circuit of three or four parallel circuits.

(3) Experience shows correct operation even where a ground may be within five per cent of the length of the line from the far end.

(4) No change in relays or character of protection is required when one circuit of a twin line is switched out.

(5) It may be used with bushing-type current transformers.

From actual trials of virtually all proposed methods the system seems best taken care of by the following relays:

(1) Overload induction type—Used on single radial feeders, so-called "stub-lines" (either with or without a residual), on auto-transformers and on smaller tie lines such as 11-kv. lines tying together parts of the system.

(2) Differential or balanced type—On generators, synchronous condensers and two-winding transformers having a rating sufficiently large to warrant it.

(3) Reverse-power and residual combinations—For receiving ends of transmission lines.

(4) Reverse-power and directional residual combinations—for the sending end of transmission lines.

(5) Directional residual relays—On ungrounded or delta-connected generators and feeders.

(6) Special connections—To meet abnormal load or power-factor conditions or badly fluctuating loads.

Inasmuch as a considerable portion of the relays are actuated from bushing-type current transformers operating at comparatively low currents, they are calibrated over-all in place. The settings are on the inverse part of the time-current curve and always above the minimum current at which the relay closes. Relays in general are made selective as to direction and amount of current and in case of necessity to time, although the directional features seem to be more reliable. Certain directional combinations involving only current have proved in service to be superior to those in which voltage and consequently power factor is involved, particularly where low settings are desired.

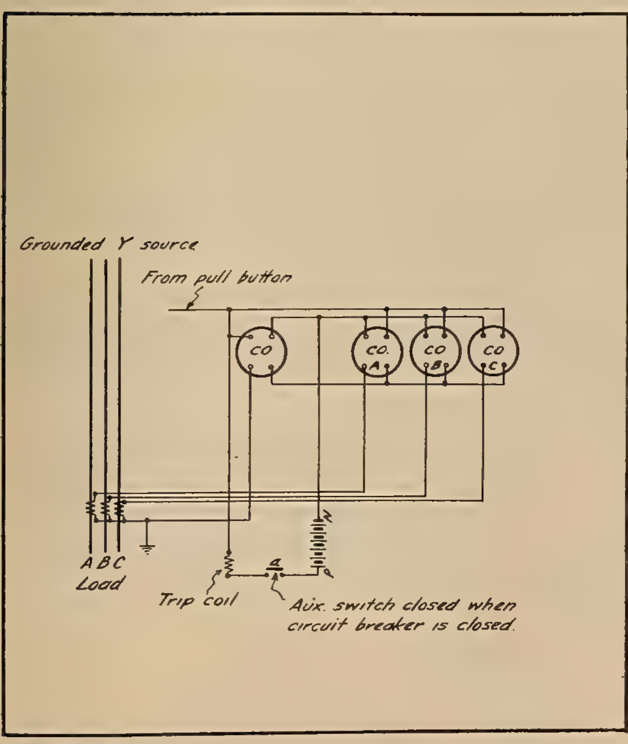


Fig. 1—Diagram of connections for three CO relays and one residual-current CO relay.

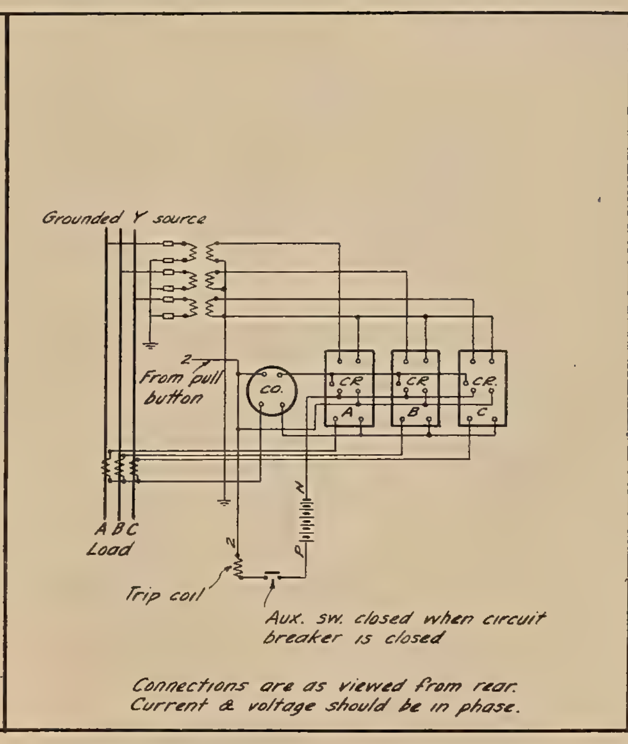


Fig. 2—Diagram of connections for three 7-stud CR relay and one residual-current CO relay.

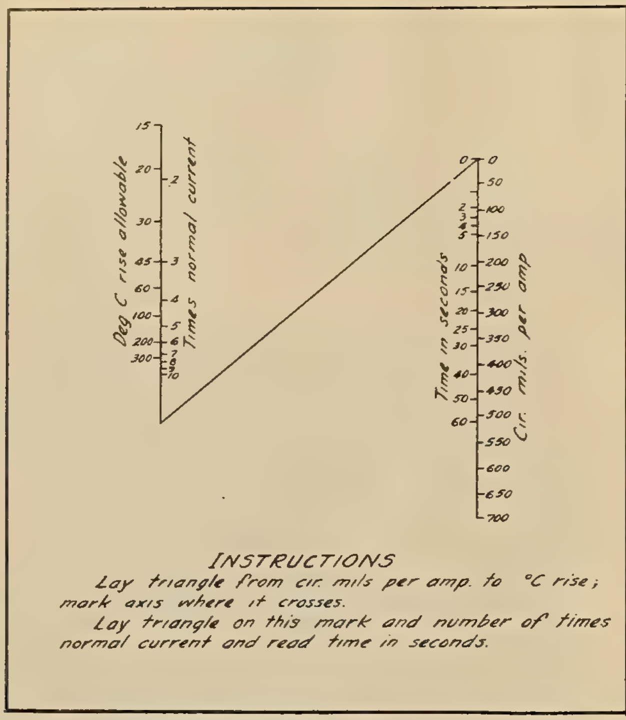


Fig. 3—Chart for calculating heating of electrical equipment under short circuit and with no radiation.

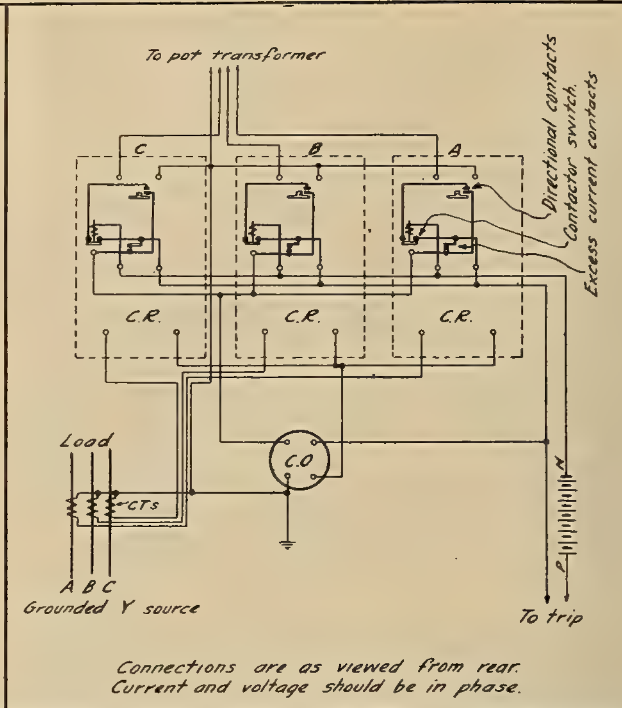


Fig. 4—Diagram of connections showing internal trip-circuit for three 7-stud CR relays and one residual-current CO relay.

Functions of Various Types

(1) In referring to overload relays it is to be noted that induction-type relays are specified. It is thought that any high-tension relay installation is of sufficient importance to justify the additional expense over the older types. High-tension current-transformer secondaries are connected Y and the simple overload connection is that usually used.

The overload induction type in use at this time is of two general types, one operating on the same principle as the ordinary induction-type watthour meter and one using a shading coil. Both types are in use on the system.

When it is desirable to separate on low values of unbalanced current or on grounds, the residual relay is connected as shown in Figs. 1 and 2. By using a relay of a lower current rating very low values of grounds and unbalance may be taken care of, in most cases as low as 20 per cent of the normal load current.

On auto-transformers at the higher voltages overload relays on all windings have been preferred. First, because the various combinations of loading possible make some sort of maximum current rating for each winding imperative, and second, because it is very difficult to balance properly a three-winding or four-winding transformer using bushing-type current transformers on the high-tension side and some other type on the low-tension side. Transformers are set within a maximum heating limit (see Fig. 3) with about 200 per cent normal current.

(2) Differential or balanced type relays are used on all Y-connected generators and synchronous condensers, and all new equipment is specified to be Y-connected. Here the current transformers are duplicates having similar characteristics, and instantaneous plunger-type overload relays commonly are used, set to trip on a current unbalance of about 20 per cent of full load.

The power-house transformers usually are protected by differential relays in order to withstand heavy overloads without clearing and yet clear on internal trouble. Trouble has been encountered in balancing where current-transformer characteristics were different. This sometimes can be helped by balancing in the magnetic circuit of the relay itself, using from, say, zero to the 4-amp. tap for one current transformer and from zero to the 6-amp. tap for the other, connected in opposition. On delta-Y banks it is customary to connect the low-tension current transformers inside the delta to insure correct phase relations.

In this connection it is of interest to note an installation of balanced relays for the protection of a bank of transformers comprising a main 60 to 100-kv. auto-transformer star winding with 11-kv. star winding. The current transformer and relay connections are shown schematically in Fig. 12. Theoretically no current would flow in the relay for all conditions of loading of both high-tension and 11-kv. windings, except for trouble within the high-tension winding. Actually the ratios of the bushing-type current-transformers varied between (14/1) and (23/1) as the load increased, while the ration of the core-type coils remained practically constant.

A consideration of the factors involved clearly indicates that it is not feasible to balance the ratios of the several current-transformers by adjusting their respective secondary loads. The ratio characteristic of the bushing-transformers is distinctly drooping, that of the core-type substantially flat. Changing the secondary load on either type raises or lowers the characteristic curve without materially changing its form. Consider also that the power factors of the 100-kv., 60-kv. and 11-kv. loads may be materially different, and so affect the phase relation of the several currents and that in this case power may be supplied from either the 100 kv. or the 60 kv., the presence or absence of a considerable 11-kv. load influencing the relative effect of the neutral CT's in either case. While it is conceivable that a substantial balance might be obtained at some particular combination of loads, this condition would not persist at other loads.

Nevertheless a setting is obtained which provides protection to the high-tension winding against failure at somewhat less than full-load rated current of the transformer. Obviously no protection is afforded against failure of the 11-kv. winding. This could of course be provided separately.

(3) Reverse-power residual combinations are in general use on the receiving ends of transmission lines. The connections in such an installation are shown in Fig. 4. Both the current and voltage on the reverse-power relays are Y-connected and they are in phase. The residual is set at from 20 per cent to 50 per cent of normal load current, and both are set to trip in a direction out from the station, i.e., back toward the power house.

(4) Reverse-power and directional residual combinations are used on the sending ends of transmission lines, either from a power house or substation. If an overcurrent relay of the common type has its two windings separated as shown in Fig. 5, it will act as a wattmeter whose windings are such as to be actuated

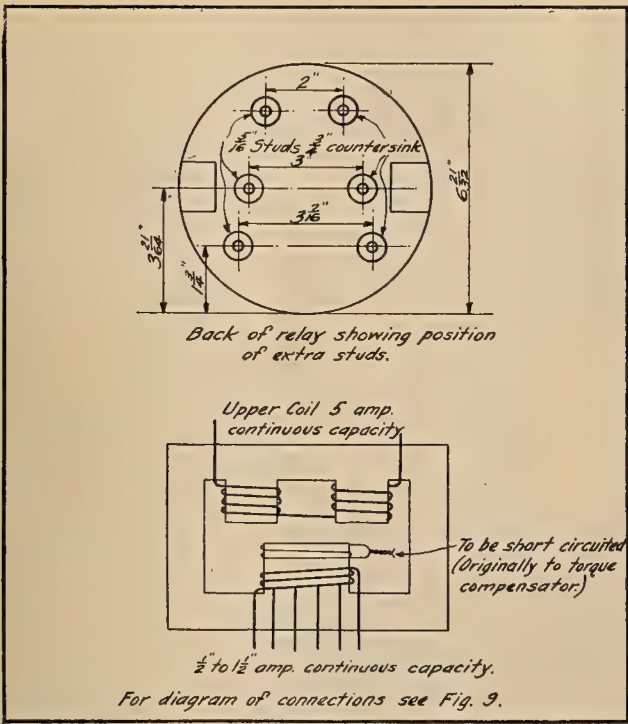


Fig. 5—Terminal location and internal connections of specially arranged directional CO relay.

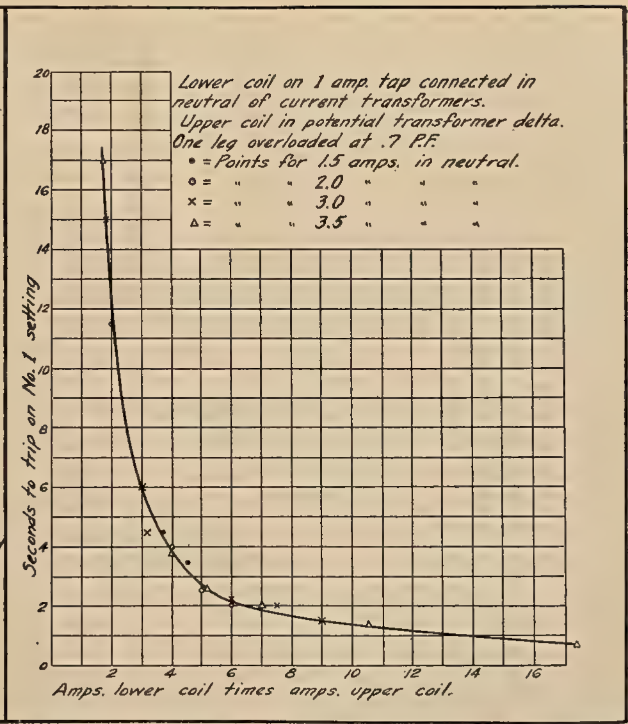


Fig. 6—Performance curve of ½/2½-amp. CO relay connected for directional operation as shown in Fig. 5.

by current transformers, with characteristics shown in Fig. 6.

If then it is connected as shown in Fig. 7 it will act as a residual, but in addition will have a direction dependent upon the relative direction of power flow in the ground lead of the transformer and the residual of the line current transformers.

For trouble on a line the power flow may be considered from the line into the ground and back up through the ground lead of the transformer bank. In this case the direction up into the bank from ground is the same wherever the ground on the line occurs, but the direction of residual of the line current transformers depends upon whether the ground is on their bus side or their line side.

This gives a standard direction for one coil of the relay and a variable direction depending on the location of the trouble for the other, both operating on current alone and operating only when there is a ground or unbalance. In addition it can in most cases be set much below the normal line current.

It will be noticed that the relay connections on the sending end of a transmission line are different from those on the receiving end. Because of the power available in the generating plant the power under practically all conditions will be outgoing on all lines, the reverse power relays being set to trip on outgoing power and standing normally closed, function simply as overloads, and non-directional residuals will not select between the line in trouble and the good line.

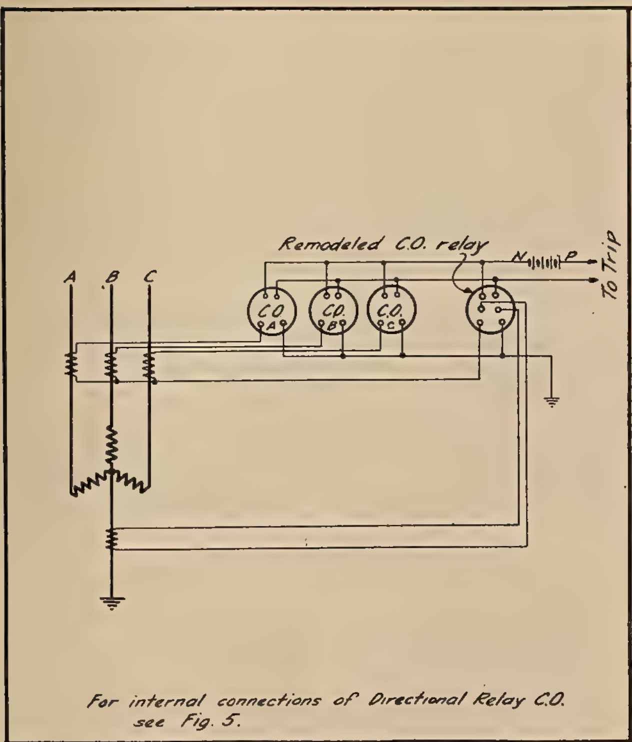


Fig. 7—Diagram of connections for three CO relays and one specially arranged, directional residual-current CO relay.

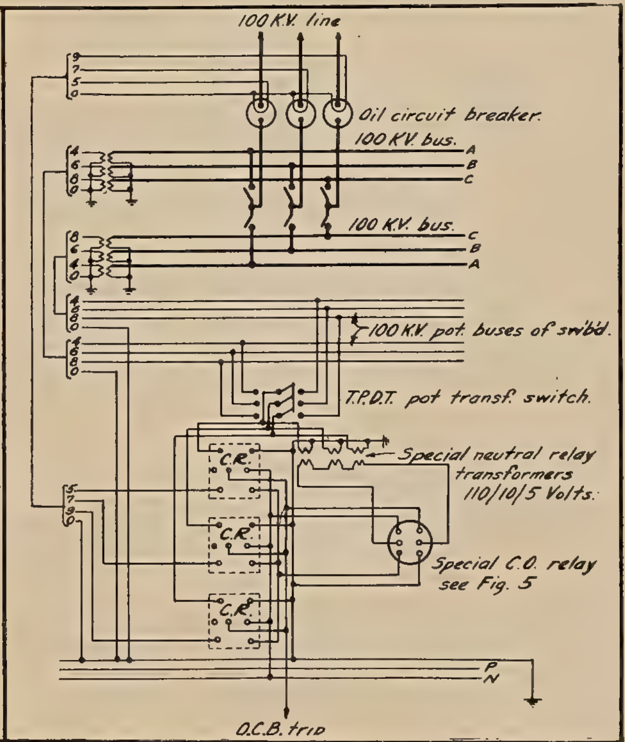


Fig. 8—Complete diagram of connections for combined directional overload and one directional residual-current CO relay.

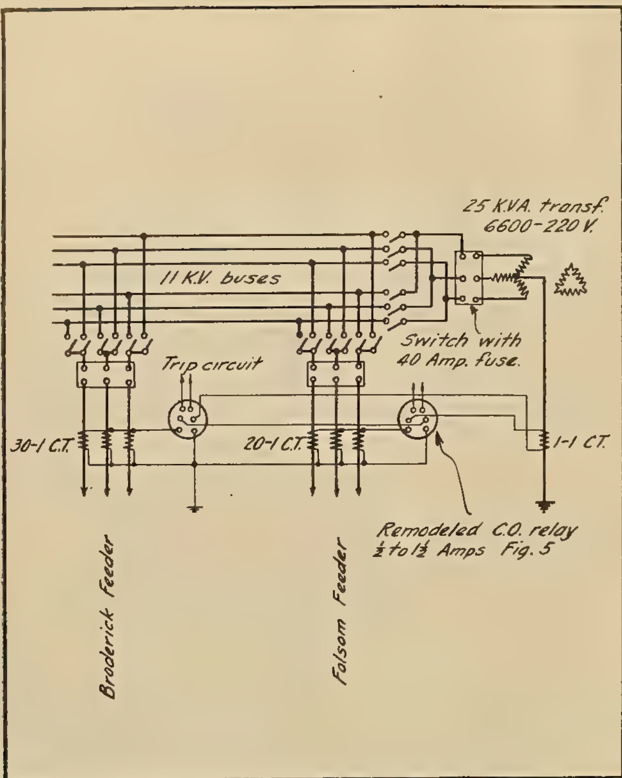


Fig. 9—Diagram of connections for specially arranged directional CO relays for directional residual-current feeder protection.

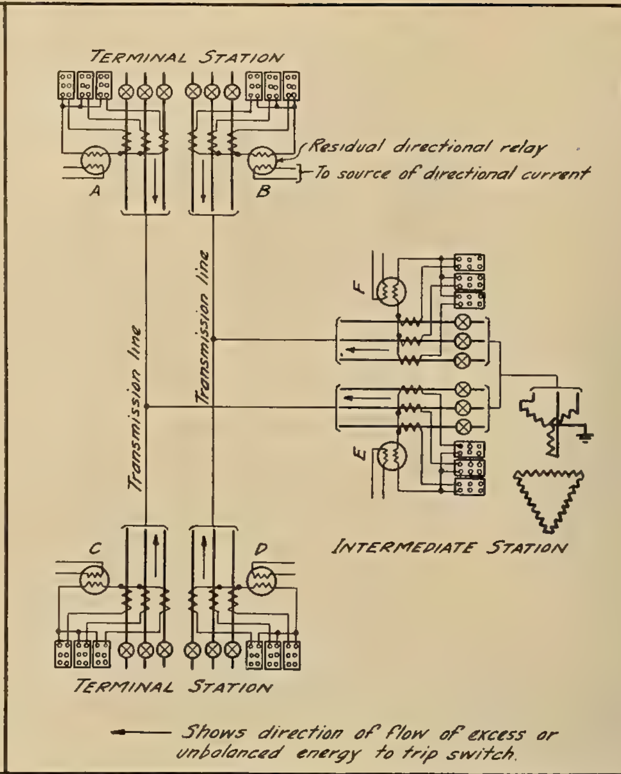


Fig. 10—Diagram of connections for ordinary high-tension transmission line relay protection.

The directional residuals on the other hand will provide the necessary selection. However, it is desirable to retain the reverse-power relays to prevent the possibility of power from feeding back on the good line and tripping it.

On the receiving end of the watt- or directional-element contacts normally stand open and a non-directional residual in conjunction therewith as shown in Fig. 2 and Fig. 4, will provide the necessary selectivity.

The combination of schemes three and four works equally well whether there is one line or several lines in operation, each line being independent of all others. It also allows tapping stations on the line between the two ends without interfering with selective operation.

On the sending ends of certain lines, as at a substation where power is outgoing from an auto-transformer and the transformer ground is not available or is unsuitable, a small 110/5-volt transformer bank is connected in Y to the potential transformer secondaries which also are connected in Y. The primaries of this small transformer bank are Y-connected and the neutral is grounded (see Fig. 8). The 5-volt side of this small bank is connected delta, with the relay coil, which is usually connected to the current transformer in the transformer ground, in series with the delta.

The miniature bank functions just as a large one save that care must be exercised in order to get a very low setting, say 20 per cent of normal, if the line current transformers are of bushing type and of comparatively low ratio. Current settings of less than normal can always be obtained, however. This combination as used is shown in Fig. 8.

In most combinations of the schemes outlined it generally can be stated that the relays should trip on power outgoing from the station (see Fig. 10).

(5) Certain feeders on the network are delta connected and ungrounded. It is desirable to separate these feeders promptly on very light grounds. This is accomplished as shown in Fig. 9, using a 25-kw. grounding bank. As shown, the bank is fused. In practice it was found necessary to relay it for overload at a high current value and a moderately short time-value. As installed, the feeders act selectively on grounds of 15 amperes and have given correct selective operation on 350 ampere grounds.

During one month that an electrically operated dredge was worked off a cable fed by one feeder there were 33 correct operations out of 33 cases of trouble in 30 days where the current to ground ranged from 20 amp. to 350 amp. In two years of operation there has been but one operation classed as questionable.

This same combination (see Fig. 9) is applicable to ungrounded equipment such as generators, and works equally well whether there is one or more than one feeder.

(6) In certain installations, particularly in interconnected substation lines, it has been found that sufficient damping can not be secured on the watt or directional element of the reverse-power relay and still give it effective operation. In such cases it has been necesssary to interconnect the watt and current element of the relay as shown in Fig. 11. In this manner the current element starts to close only after the watt element is completely closed. This is accomplished by putting the watt element contacts in series with the top coil of the current element, leaving intact the winding connected to the current transformer.

In certain cases it also has been necessary to provide for a low tripping current in one direction and a comparatively heavy load current in the opposite direction. This has been taken care of by building a small reactance and shunting it directly across the relay current studs.

At low current values the relay takes nearly all of the current and so can be set for a low reverse value, while at higher values of incoming power the point of saturation on the reactance is passed and most of the current flows through it. A ratio of two or three to one thus can be obtained. The equipment should be calibrated under working conditions. Any changes in current settings on the relay require a new calibration.

In other cases widely differing settings are desired and it is arranged to have a miniature "ratio changer" on the relay taps. Such special cases are encountered only occasionally and must be taken care of in the particular manner which the the case demands.

On the greater number of the system relay installations it is desirable to ring a bell and light a pilot lamp when a relay operates, in addition to the primary function of tripping switches. This is done by using a secondary relay, usually a plunger-type, hand-reset, multiple-contact, circuit-closing type. From experience it has been found that it pays to use the best obtainable.

Necessary Conditions

In order to obtain successful relay operation the questions enumerated below had to be answered by actual trial.

(a) The possibilities of bushing type current transformers came first. These transformers make a high-tension relay system possible and have proved thoroughly satisfactory where currents above 80 amperes are available, if properly applied.

It is advisable always to use relays of a low energy consumption on bushing-type current transformers, with especial emphasis on low ratio transformers. (There are in satisfactory use on the system bushing-type current transformers on transformer terminal bushings where the laminations were cut from sheet steel, assembled on the bushing and wound in place.) Low-ratio current transformers should not have the secondary overloaded either in volts or volt-amperes. A high-impedance secondary load is fatal to bushing current transformer ratios.

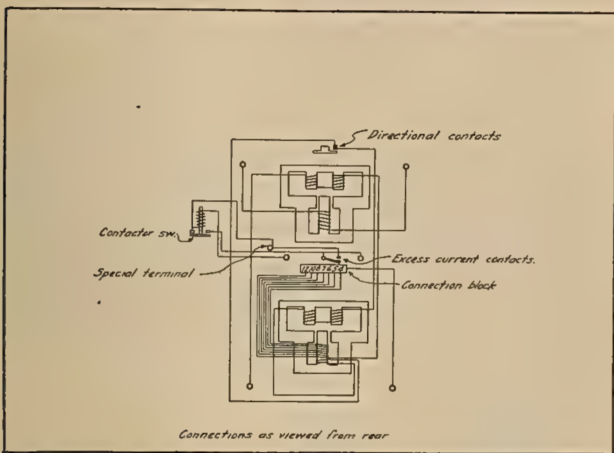


Fig. 11—Internal connection diagram for 7-stud CR relay arranged for control of current element by watt element.

On the system network bushing-type current transformers are calibrated over-all in place by applying current from a 110-220/10-volt transformer through the lead itself or through oil-switch terminals. Each time a current setting is changed this is repeated. Ammeters and indicating wattmeters are in satisfactory use on bushing type current transformers, but preferably should have a separate transformer from that used for the relays. These instruments are purchased with blank scale and are calibrated in place in the same ways as the relays with the addition of a phase shifter to secure the proper wattmeter potential. Any changes in the load on the current transformer secondary, i. e., more or less meters, make it necessary to recalibrate. If meters and relays share a transformer, any changes in relay current-setting make a recalibration necessary.

(b) It has been found by trial that the best operation on the system is had by connecting the current and the potential of the reverse-power relays in phase. This probably is due to the fact that at light loads there is a very low leading power factor, but under short circuit a comparatively high lagging power factor.

(c) All reverse-power relays are single phase. It was found by trial that a three-phase reverse-power relay did not necessarily reverse when only one phase was in trouble.

(d) Differential and directional residual relays should be tested by grounding one phase of the equipment under test and building up voltage until sufficient current is generated at normal frequency to trip. No other method has proved satisfactory.

(e) It is desirable to have relay test switches so arranged that a relay may be cut out of service without changing any wiring.

(f) Proper phase relation of current and voltage, i.e., A-phase current with A-phase voltage is vital to proper reverse-power relay operation. Checking polarity marks or a wiring diagram is not sufficient. The customary method is to use a single-phase wattmeter and apply successively the different voltages to one current. (See A.I.E.E. Journal, 1924, P. C. Jones, "Watt-meter Connections.")

Not all of the schemes and methods outlined above are essential, nor are they the only means of accomplishing the desired results. They are however, accomplishing these results on one of the largest high-tension networks in existence in a fairly satisfactory manner. The chief load dispatcher's statement of correct relay operations on the high-tension network for the two years just past, shown in Table I, bears witness.

Explanation of Analysis

Col. 1. Total Operations Involving Relays—All cases of trouble on the system, which investigation showed involved the relays in service. This comprises the total of the other columns. (Note: Relay operations due to accidental shorting or closing of contacts are not included in this tabulation, nor any failures of a switch to operate due to break, ground, or other fault in the tripping circuit or to mechanical defect in the switch or auxiliary apparatus external to the relay itself.)

TABLE I.—Analysis of relay operation on the 220-kv., 110-kv., and 60-kv. transmission network of the Pacific Gas and Electric Company for 1923 and 1924.

	1	2		3		4		5		6	
						Incorrect relay operations					
	Total operations involving relays	Correct relay operations		Relay failures		Due to relay		Due to external causes		Questionable relay operations	
Year	No.	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1923	1,593	1,490	93.6	24	1.5	11	.7	40	2.5	28	1.7
1924	1,884	1,699	90.2	31	1.6	3	.2	108	5.7	43	2.3

Col. 2. Correct Relay Operations.—All relay operations which have been proved to be correct under the conditions existing at the time. This includes many cases which were not entirely satisfactory from an operating standpoint, but where, owing to load, voltage, and power-factor conditions, it was necessary to credit the relays with correct operation, considering their connections and settings. There also are included here a number of cases where unsatisfactory relay operation occurred due to inadequate equipment. (See also Cols. 4 and 5.) In all cases, however, the relays themselves functioned correctly considering the circumstances.

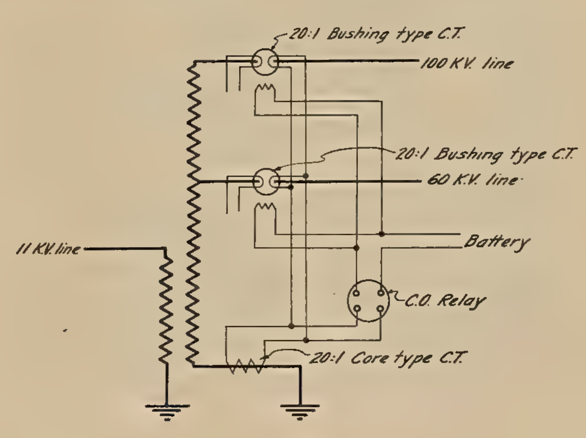


FIG. 12
SCHEMATIC DIAGRAM OF BALANCED PROTECTION OF THREE WINDING TRANSFORMER BANK. ONE PHASE SHOWN.

Fig. 12—Schematic wiring diagram showing balanced protection of three-winding transformer bank. One phase shown.

Col. 3. Relay Failures (No Operation of Switch).—All cases where subsequent investigation has proved that conditions at the point in question were such

as to permit correct relay operation, but the relays failed to function and the switch did not operate. No case of failure of switch to operate is listed in this tabulation if investigation proved the failure to be due to a break, ground or other fault in the d.c. tripping circuit, or to mechanical defect in the switch or auxiliary apparatus external to the relay itself.

Col. 4, Incorrect Relay Operations Due to Relay.—All cases of switch operation that have been proved by subsequent investigation and test to be due to faults, either mechanical or electrical, in the relays themselves. (Note: This does not include relay operations which apparently were faulty because of indequate equipment or improper connections.)

Col. 5, Incorrect Relay Operations Due to External Causes.—All cases of switch operation which investigation showed to be the results of faults or improper connections in auxiliary apparatus external to the relays themselves, or to power factor or other conditions on the system.

Col. 6, Questionable Relay Operations.—All switch operations which it has been found impossible to classify under Cols. 2, 4 or 5. In most cases the operation has been unsatisfactory, but owing to lack of evidence it was considered unfair to classify it as incorrect, particularly as a test made after the trouble showed the relays to be operating correctly so far as could be determined.

Obviously every case of trouble on a network such as the one here under discussion involves a number of relay installations successively distant from the fault, and the proper selection as to the load or time whereby the more remote installations correctly function is not included in this tabulation.

The slight decrease in percentage of correct operation in 1924 as compared with 1923 is attributed primarily to the increased accuracy and thoroughness with which the investigations were conducted in that year, as well as to a considerable increase in the number of relay installations involved.

A departure from the usual practice has been made in the application of the type OX auxiliary relay of the Westinghouse company. The relay is connected so that normally it is latched, and is tripped by applying current to the unlatching coil, and reset by means of the operating coil, thus providing positive mechanical action in closing, with the least possible energy requirement precedent thereto.

Design and Application of System Calculating Board

BY R. C. DENNY

WHILE fully cognizant of the fact that the results derived from a calculating board would only approximate actual conditions and give only initial values, it was thought that the information would be of considerable use because the values would be proportionately correct. It is upon a knowledge of these relative current conditions existing on a system during line troubles that a comprehensive or system-wide plan of relay operation is based. The calculating board described was built up within the year and built to represent a specific generation and transmission-system setup. A front view of this board is shown in Fig. 1. Fourteen generating stations totaling approximately 145,000 kva. tied in on an interconnected transmission network of practically 1,400 miles of 110-kv., 69-kv. and 33-kv. lines. The system generating capacity is augmented by perhaps 55,000 kva., available through interconnections with adjoining systems.

As in most modern calculating boards it is the reactance values of the individual generating units, transformer banks and line sections that are represented by resistance units. The error is thus on the safe side as the current indicated on the various short circuit tests will be in excess of what it actually would be in case of line troubles. As it was desired to operate the board at one certain voltage, the reactance values in the case of the San Joaquin board were reduced to terms of 69-kv. or 40,100 volts to ground which is really the extensive part of the transmission system and that upon which most of the troubles occur. The resistor units are of fixed resistance values and are of the viterous enamel type. There are one hundred and thirty-one of them in all, mounted end on end between the shelves as pictured in Fig. 2. They are held in place by copper rods passing down through them. The selection of the unit resistance value or actual resistance value corres-

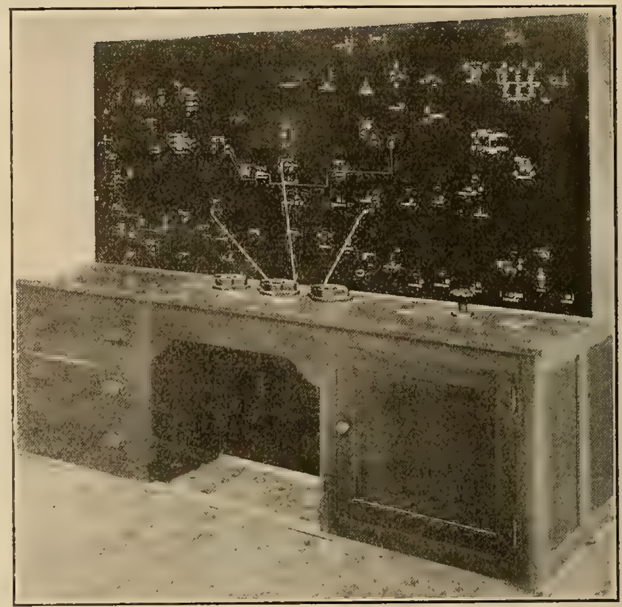


Fig. 1.—Front view of system calculating board used by San Joaquin Light & Power Corporation.

ponding to 100 ohms reactance was based upon the rated carrying capacity of certain standard resistors which were very desirable on account of their low cost. This further resulted in a low power consumption and afforded an opportunity to economize on the power unit. Seven hundred and fifty ohms was the unit resistance value chosen and the range of actual resistance for the different classes of units are given in the following tabulation:

Classes	Number	Ohms of resistors
Line sections	79	9.8 to 774.9
Generators	12	375.0 to 1447.5
Synchronous condensers	3	1,980. to 3015.
Power house trans. banks	13	157.8 to 510.0
Substation trans. banks	16	60. to 1200.
Generators and trans. banks combined	8	1,192.5 to 3232.5

The resistors are connected to jacks on the panel immediately in front of them after the manner shown in Fig. 3. These jacks, some 170 in all, are of the closed circuit type, the springs being separated when a plug is inserted. Three plugs are used; one for simulating short circuits, one for series readings in the several branches contributing to most "shorts" and the third for measuring voltage drop on "shorts" and testing for resistor troubles or "opens."' The jacks used were chosen for their sturdy design and simplicty of mounting. They have unusually heavy bronze springs which insure positive low-resistance contact. Dummy plugs are provided for use when any unit or line on the system is switched out of service. By means of key switches, either of two milliammeter may be switched into the short-circuit cord or the line-series cord and while in the latter the current may be reversed by a third key. The fourth key is for the purpose of switching the voltmeter across the generator or onto the cord for measurements on the board. A condenser prevents excessive arcing on the short-circuit key.

The cabinet itself is 30 x 72 x 96 in. in overall dimensions and is built of quarter-sawed oak finished to match the surrounding office furniture. The size was influenced mostly by the panel which is a standard stock size of ebony abestos material, ¼ x 42 x 96 in. The shelves are made of maple so that withal it is a very substantial piece of equipment. There is ample drawer room in one end while a large door in the opposite end gives easy access to the power unit housed therein. This unit is a motor-generator set comprised of a ½-hp., 220-volt, 1,750-r.p.m., single-phase motor direct connected to a 1/3-kw., 125-volt, shunt-wound generator. The unit rests on felt strips on the concrete floor and is not objectionably noisy. The bench part of the board is 30 in. high and 20 in. wide and has mounted on it the meter

equipment, keys, plugs, rheostat and flush switches. Two milliammeters are used, one having a scale 0-2,000 and the other 0-800. The third instrument is an 0-150 voltmeter.

The transmission system was laid out on the panel as nearly geographically correct as practical, to facilitate comprehensive observations. The lines were ruled on with show-card-writer's ink, different colors being used to designate the different voltages. After the ink had become thoroughly dry the entire face of the panel was given a coat of transparent varnish. Holes for the jacks then were drilled, after which the panel was fas-

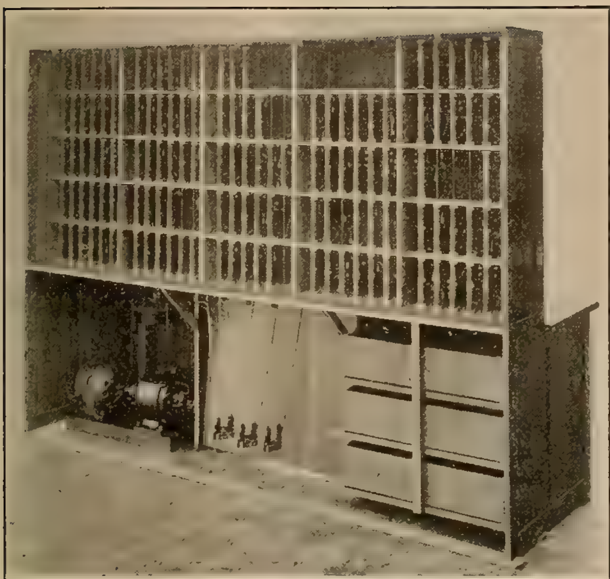


Fig. 2.—Rear view of system calculating board used by San Joaquin Light & Power Corporation.

tened in its permanent position and the jacks mounted. One terminal of each of the resistors representing generators and synchronous condensers is connected to a common bus leading directly to one terminal of the 125-volt generator. The other terminals of such resistors are connected to resistors representing their respective transformer banks and those to the line resistors, etc. The jacks simply are cut in at the junction points so that the cord which is in series with the milliammeter and the other terminal of the generator may be plugged in at any junction point, completing the circuit and

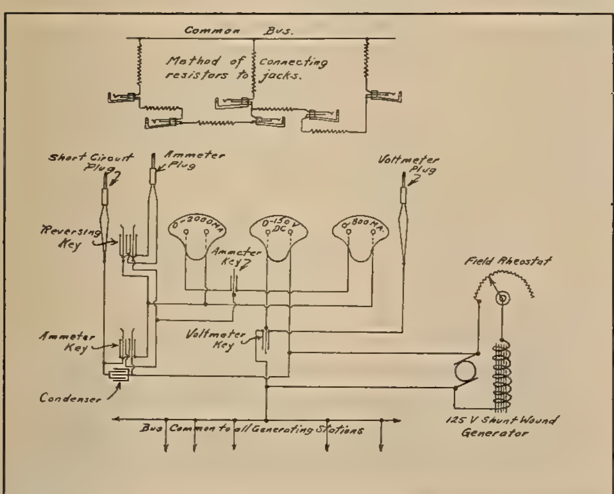


Fig. 3.—Schematic wiring diagram of San Joaquin Light & Power Corporation calculating board.

simulating a "short." Total short-circuit currents as high as 1.2 amp. thus have been obtained.

The current indicated then is multiplied by the constant for that particular part of the transmission system, which is 2,500 for the 69-kv. system with the test voltage held normal at 120. This gives the instantaneous value of the short circuit in amperes from where the time-decay values may be estimated by referring to the proper decrement curves. Such information is what the operating and engineering departments primarily are interested in from the standpoint of the protective-relay system and the rupturing capacity of switches. The board also has proved useful in connection with a study of voltage-drop conditions for three-phase short circuits on the 110-kv. main system-trunk line. It has been demonstrated upon several occasions that inverse-time induction relays are not entirely adequate for this purpose, although they function satisfactorily for single-phase disturbances or grounds. Residual relays are not to be trusted for the purpose. Hence an induction-type undervoltage relay is seriously being considered. This is not the so-called impedance relay, but simply a voltage-actuated relay used in conjunction with the directional type already installed and whose contacts will shunt the current-actuated contacts of the directional relays. It since has been learned that this same system of protection has received considerable discussion in Europe and is in use on two systems in Germany.

Pacific Electric Manufacturing Company Meter Transformer Characteristics

THIS transformer (Fig. 1) is built with a wound primary connected by short flexible conductors to one of the contact brackets and contacts of the circuit breaker, the circuit being diverted through it by an insulating plate between the bracket and the contact. The primary coil can be wound for any ratio specified, the lowest heretofore required being 1/1 or a five-amp. primary and a five-amp. secondary winding. It is mounted on a micanite tube with half-inch wall which

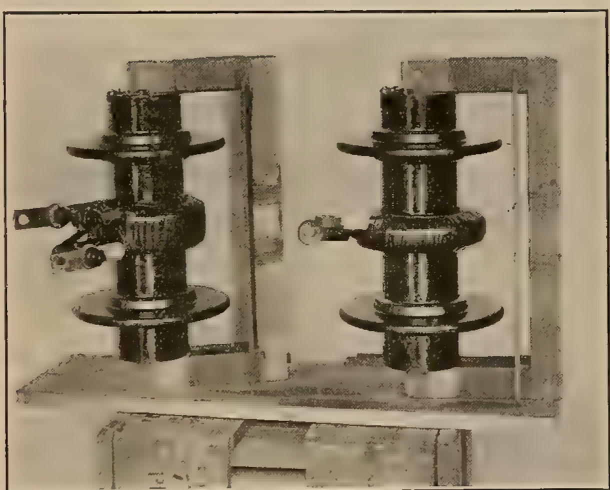


Fig. 1—New design of 70-kv. meter transformer. This transformer is mounted within the circuit breaker tank below the oil level.

separates it from the secondary circuit and the core and on which also are mounted moulded bakelite barriers to increase the creepage distance between the core and the coil. Where the core completes its magnetic circuit around the coil a bakelite plate is set to augment the taped insulation of the primary coil. The core is suspended by a clamping bracket extending downward from the tank top and thoroughly grounding it. The secondary circuit is wound on a fiber tube which slips over the core and prevents injury to the insulation from the edges of the laminations and which with the secondary winding is set inside the micanite tube. The secondary circuit is wound with two parallel wires one of which is of a different circ. mil cross section, thus having a turn or two more than the other and permitting a slight exchange of current. This has the effect of greatly improving the characteristics of the transformer. One each of the terminals of the primary and secondary winding is painted with white enamel for polarity indication so that if the two white or positive terminals are connected together the connection will give an additive polarity.

The characteristics of this transformer have been worked out, and the transformers are being manufac-

tured under certain patents of Otto Knopp, one of the engineers of the Pacific Gas and Electric Company who is engaged in such work and is an authority on transformers.

The standard 70-kv. current transformer is compensated for the useful burden of one watthour meter with leads, giving a total burden of three volt-amperes. The special reactance furnished with the transformer is connected in series with the secondary circuit in the oil circuit breaker. The two cures "AA" (Fig. 2) for ratio and phase angle represent the performance under this condition. The phase angle is small, assuring high accuracy with low and varying power factor.

With the useful burden of 30 volt-amperes and 25 watts (the special reactance remaining in series with the secondary burden), the two curves "BB" represent the performance of the transformer. This condition will prevail when relays, curve-drawing ammeters and other instruments are connected to the secondary. In

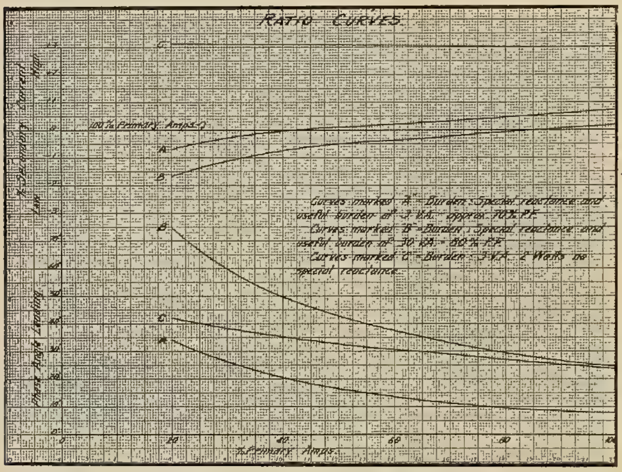


Fig. 2—Characteristic curves of the 70-kv. Pacific Electric meter transformer shown in Fig. 1.

this case the phase angle has no influence upon the instruments.

For special cases where a high line power factor prevails and watthour measurements of high accuracy are desired, the special reactance may be disconnected and the performance shown in curves "CC" obtained with a single watthour meter and leads representing three volt-amperes connected to the secondary.

At high power factors phase angle has very little effect and by adjusting the watthour meter to compensate for the constant ratio error a very high metering accuracy is obtained.

If desired, the transformer can be furnished specially compensated for the above mentioned burden in which case the ratio error will be practically zero, within plus or minus 0.1 per cent.

Automatic Substations on San Joaquin and Affiliated Systems

By E. K. SADLER

THE need to improve service without increasing the cost of operation has been the main reason for installing automatic switch-reclosing equipment on this system. In the case of new substations in outlying districts, the cost of additional property and buildings necessary to take care of an operator is alone much greater than the cost of making the substation completely automatic. The service at substations employing no regular operator, the station being attended by some employee in the neighborhood, has been improved greatly by the installation of automatic reclosing equipment. In other cases it has been found possible to release the operator for other duties by making the substation automatic.

Work was started in 1921 on the first automatic substation on this system. At that time there was no available equipment on the market that could be bought for a reasonable price which was suitable for the needs of the station being planned. The switches for this station already had been ordered. It was found advisable to design completely the needed automatic reclosing equipment and to build this equipment in the company's shops. This designing was handled in the office of C. E. Schnell, electrical designing engineer of the company. The equipment was designed and built at a considerable saving to the company. This equipment was used, with but minor changes to meet the type of circuit breaker installed, at the first five substations made automatic by this company. The same scheme, but redesigned and made by an outside manufacturing company, was used on the later installations.

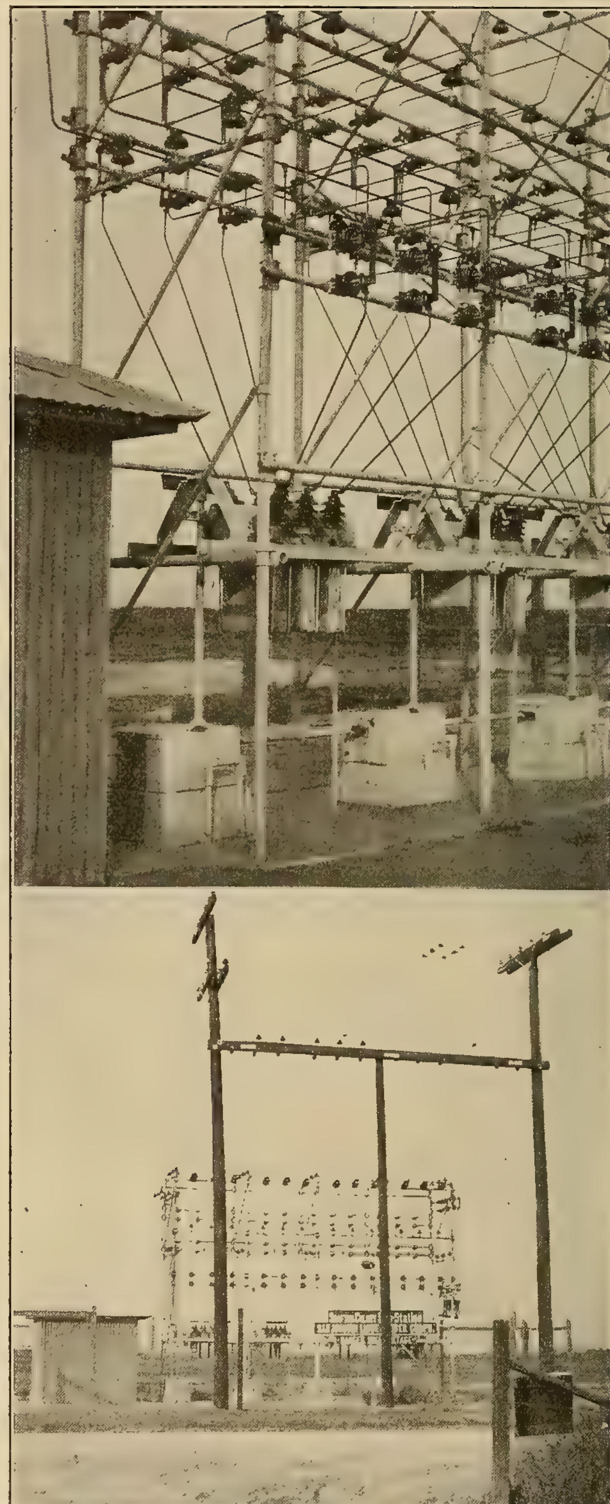


Fig. 1—Shafter automatic substation showing (above) type S-1 reclosing mechanism as installed. The pipe rod extending horizontally between the operating mechanism housings, shown beneath each switch, is the oscillating actuator shaft. Extending from each housing up to an extension of the circuit breaker frame may be noted the rod which is rotated through a small arc by the actuator shaft transmitting the necessary closing motion to the circuit breaker mechanism. Below is a general view of the substation.

Description of this apparatus and its operation will be given in another part of this article.

A brief sketch of each of the automatic substations outlining the reason for making them automatic, the kind of equipment used and records of operation is given in the following text. The substations are listed in the order that they were cut into service as automatic stations.

Shafter Substation

This was a new outdoor-type switching station handling feeders and built on the end of a seven-mile 11-kv. line. It was built in a sparsely settled farming district having considerable pumping load.

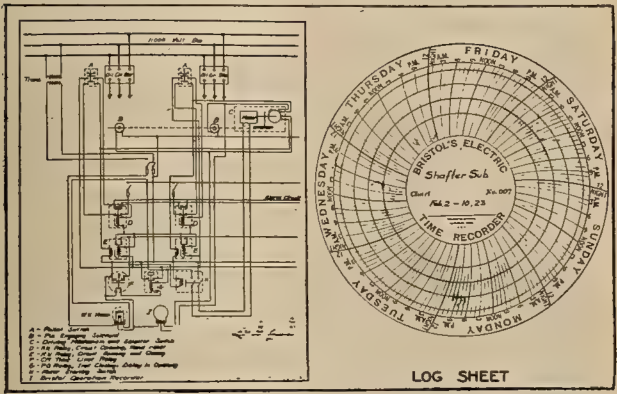


Fig. 2—Showing (left) a wiring diagram of the control circuits for the automatic equipment at Shafter substation, and (right) a reproduction of a typical log sheet. The radial marks indicate circuit troubles.

The circuit breakers were outdoor type FKO-37, 15,000-volt, 400 amperes. The protection was series trip from bushing-type current transformers. The reclosing mechanism is of the reciprocating, gang-operating type. Standard latching and unlatching relays were used in connection with the mechanism. The reclosing mechanism is fully selective. The time interval between closing is two minutes and the number of closings before locking out any breaker is three. All of the equipment is outdoors except the switchboard and driving mechanism.

These are housed in a small building 7 x 8 ft. A complete description of this mechanism will be found in an article by C. E. Schnell in the Electrical World of Feb. 9, 1924.

Although the first installation of its kind on this system, the operation of the reclosing mechanism has been 100 per cent to date. An operation recorder with a seven-day chart and a pen for each circuit breaker keeps the log of the substation. From Jan. 1 to Oct. 31, 1924, the records show 18 kickouts. Of this number three were lockouts being caused by a wind storm shorting wires, crane flying into line burning it down and a tree falling into the line. Although the mechanism was provided with alarm contacts, the cost to run a seven mile alarm line was found to be more than the cost of the automatic equipment so never has been installed to date. The lockout on any feeder circuit is reported to the district office by some customer who has noticed the loss of service.

The only change that has been made in the installation since it was built was to substitute a limit switch, driven by the driving mechanism, for a time limit relay. This was not done because of any trouble, but to remove any chance of trouble. The total cost of this substation including land and 15 per cent overhead was approximately $9,000. The cost of the automatic switch-reclosing mechanism installed was around $2,200.

Los Banos Substation

This substation is a 60-kv. station having four 11-kv. feeder switches. The substation is located in the town of Los Banos. Two of the feeders are quite long and serve a dairy country where many short circuits are caused by cranes and other large birds flying into the lines. The feeder switches are indoor type K-32 B, 15,000 volts, 400 amperes. The protection for them is series trip. There also is a master switch protected by PQ-3 relays. The setting on this switch was made high and it was not made automatic reclosing. There never was an operator at this substation. Notice of kick-out received by an alarm at the company's office several blocks distant, during the day time and at the residence of an employee during the hours the office was closed. In case of a kick-out, it required several minutes for someone to get down to the substation and close the breaker. As there were several creameries

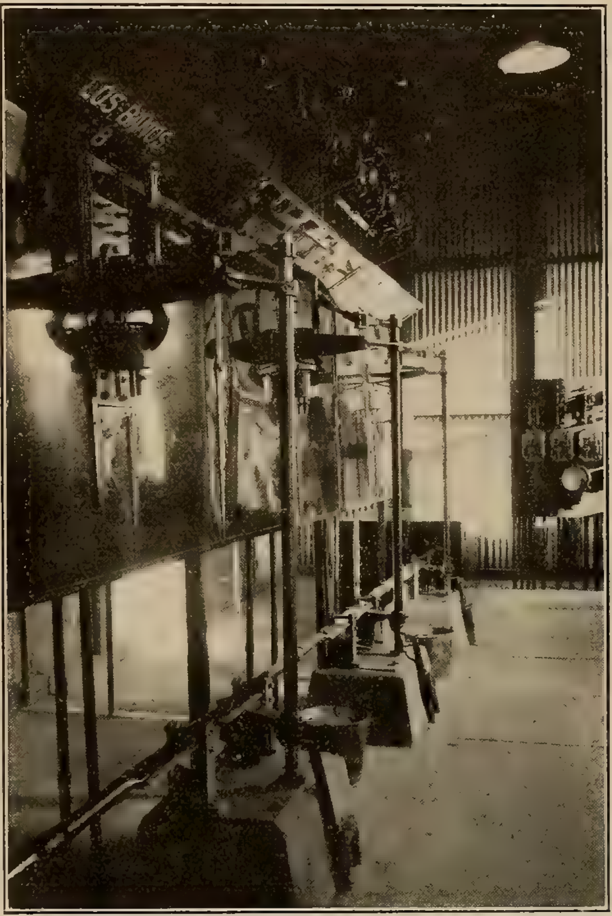


Fig. 3—Automatic switch reclosing mechanism as installed indoors at Los Banos substation. This is one of the earlier installations. In the right background may be noted the instrument panel typical of this class of substation.

supplied with this substation and as any interruption to service lasting more than two minutes was of serious consequence to them, it was necessary to improve the service. It was decided that to install automatic reclosing would be the best way to accomplish this.

The mechanism installed was the same as that at the Shafter station except that the standard latching and unlatching relays were replaced by the type SS automatic switch-reclosing relays. These relays had been developed by the company for use at the California Avenue substation. It was found that with the first set-up of relays as used at Shafter, if one switch should trip out just at the moment that another switch was being reclosed for the third time the mechanism would lock out the last switch that tripped out without attempting to reclose it. The alarm circuit of course would be energized. The SS relays were used in order to remove all chance of any switch not getting its full number of reclosures. Records of operations, however, never have shown the condition mentioned to have happened. For that matter the chance of its happening is so remote that the additional cost of the SS relays may not be warranted in most installations.

The time interval between reclosing at Los Banos is one minute and the number of reclosures before locking out is three.

The log of the substation from Jan. 1 to Aug. 31, 1924, shows 37 kick-outs and only one lock-out. The lock-out was caused by a pole burning down. Mr. Hancock, the district manager at Los Banos, stated that very few complaints were received at his office since making the station automatic compared with the number previously received. Figuring that on every kick-out of a feeder switch there is ten minutes saved in

time of restoring service, due to the automatic reclosing, the saving in loss of power sold due to interruptions amounted to 5,040 kw-hr. from January to September, 1924. The main advantage, however, derived from automatic reclosing is the better service rendered and the therefore more contented customers. The total cost of making the substation automatic-reclosing was approximately $2,700. The increase in the cost at this station over the cost of the Shafter installation was due to the use of the SS relays.

Crane Valley Sugar Pine Substation

This substation was built at the site of our Crane Valley automatic power house. The voltage is stepped down from 60 kv. to 20 kv. to supply power for extensive logging operations several miles distant. The service on this line is very severe, with many short circuits due to the logging operations. The operator lives some distance away from the substation and had many duties to perform other than tending the substation. It required some time for him to get down to

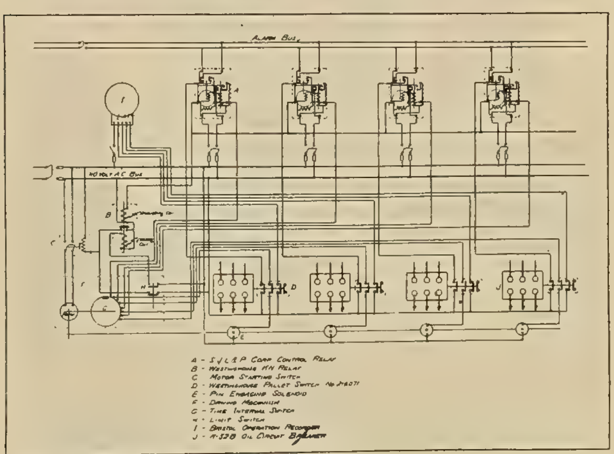


Fig. 4—Wiring diagram of control, operating and alarm circuits of the Los Banos substation.

the station in case the circuit breaker tripped out. It became necessary either to hire another operator or make the switch automatic-reclosing. It was decided to do the latter.

The switch was a 60-kv. Pacific Electric outdoor type, and was installed on the 20-kv. side of the transformer bank. Protection consisted of CO relays in connection with a timing relay so that the breaker would not trip out on overloads of short duration.

As the lumber company was demanding better service at once the reclosing equipment was built in the company shops, being an adaption of the former gang scheme built to operate one switch only. The mechanism was built and completely installed in two weeks' time. Mechanical parts are outdoors under the circuit breaker covered by a weather-proof housing. Relays and operation recorder are mounted on a panel indoors with the other switchboard equipment. The apparatus has operated satisfactorily to date under very severe conditions. The time interval between closings is two minutes and the number of closings before locking out is three.

The log of the substation from April 10 to Nov. 1, 1924, shows 33 kick-outs. Of this number only three were lock-outs. The lock-outs all were due to trees falling into the line. The cost of the automatic equipment installed was $1,050.

Lompoc Substation

This substation on the system of the Midland Counties Public Service Corporation is located in the town of Lompoc and is on the end of a 60-kv. line. The town of Lompoc owns its distribution system and buys power wholesale at 11-kv. There are three other 11-kv. feeders running from this station. One of these furnishes power to the Celite Products Company, the other supplies power to oil fields while the third runs through an agricultural district.

It was decided to install automatic reclosing mechanism on all four feeder switches with provisions for a fifth switch. At first it was intended to retain the operator at Lompoc, the automatic reclosing equipment allowing him to attend to other duties around the district. However, the automatic reclosing proved so successful that the operator was removed from the district altogether. Arrangements were made with the manager of the local power company to look after the station. The alarm circuit was connected with his office and residence.

The circuit breakers are type FK-12, 15-kv., 300 amperes. The reclosing equipment is the same as that used at Los Banos. No trouble has been experienced with the apparatus at this station to date. The log

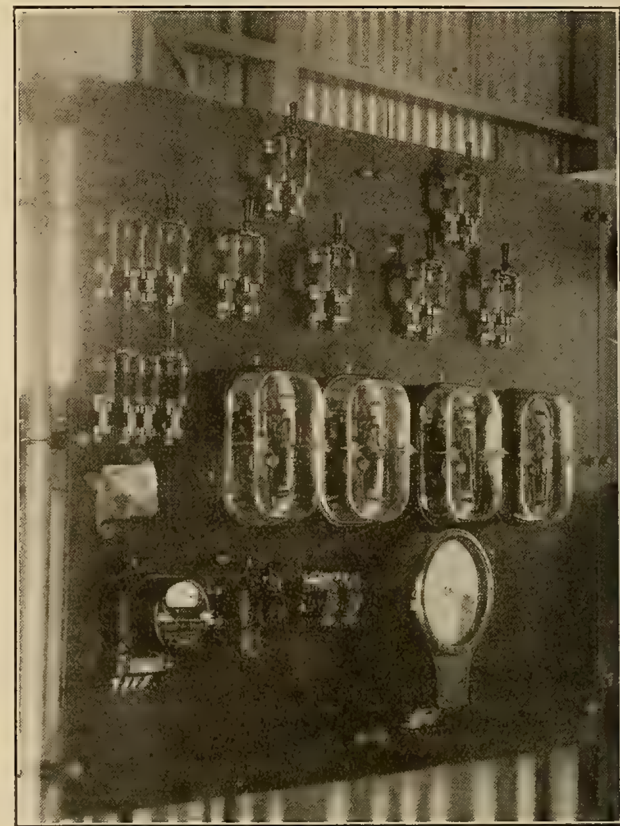


Fig. 5—Control panel at Lompoc substation.

of the station from Jan. 1 to Oct. 12, 1924, shows sixty-one kick-outs. Of this number 12 were lock-outs. This substation is only a few miles from the ocean and the fact that there is considerable fog and moisture in the air a good part of the time accounts for the large number of kick-outs. The total cost of the automatic reclosing equipment including installation was approximately $2,150. This figure includes 15 per cent overhead.

California Avenue Substation

This is an important substation of 18,000 kva. capacity supplying the city of Fresno.

Feeder switches are truck-type, Condit F-10. They are installed in cells and remote controlled. Although three operators are employed here, it was decided to make twelve of the feeder switches automatic reclosing. It was believed that this would shorten interruptions and improve service. At the time this installation was being planned, it was found impossible to secure a relay suitable for this reclosing service. This lead to the development of the SS automatic switch reclosing relay.

This relay is self-contained and to make the circuit breakers automatic-reclosing it was necessary only to mount the relays on the switchboard, one above each control switch. Simply by connecting the relay to the existing control circuit, the feeder switch was made automatic-reclosing. A single-pole switch mounted below the relay provides means for cutting the relay out of service if manual control is desired. The timing of the relay is set at fifteen seconds between closing with three closings before locking out and sounding the alarm bell. This setting can be changed to any interval and number desired, by 15-second steps, up to six minutes.

This equipment has proved very satisfactory, the operators reporting that a feeder switch often trips

out and is reclosed before they could have located the trouble and reached the board to reclose the switch. Several cases of lock-outs at this station also have been reported.

The total cost of this automatic reclosing equipment installed was approximately $2,350.

Le Grand Substation

This substation is on a tap of a 60-kv. line and is located in a sparsely settled district. There is no oil switch on the primary side of the transformer bank. On the 11-kv. side there are four feeder switches and a master switch.

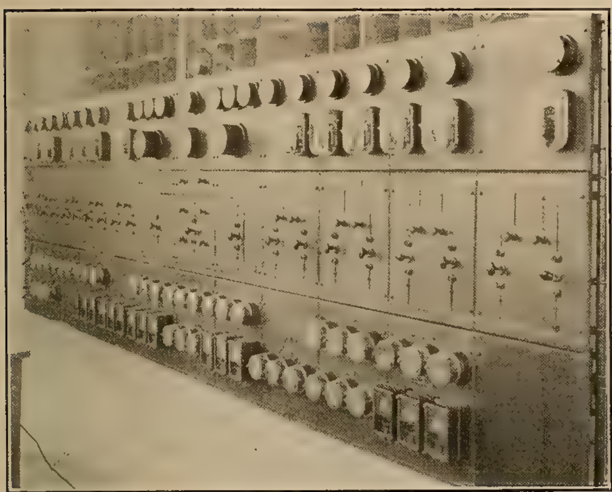


Fig. 6—California Avenue substation 11-kv. switchboard.

The circuit breakers are outdoor-type, Kelman F-6, 15-kv., six-break and are mounted on trucks. All the switching equipment is outdoor type and mounted on a pipe rack. Protection is furnished by CO relays. The switchboard, battery and air compressor are in a small concrete building. This substation is to be an important 110-kv. to 60/11-kv. station in the near future and the 11-kv. switching equipment was built to meet the requirements of the large station. The feeder switches were manually operated when installed.

It was decided to make the station automatic, so air operated mechanisms were obtained from the switch manufacturer to replace the manually operated mechanism. An automatic air-compressor set operated by a 2-hp. motor also was installed. To make the circuit breakers automatic reclosing it then was necessary only to install type SS relays and connect them to the control circuit of the solenoid-operated air valves in the switch-operating mechanism.

The automatic reclosing mechanism has operated satisfactorily to date but some trouble has been experienced with the air-compressor set. This trouble was due to failure of the automatic pressure switch to shut the unit down.

It was attempted to use the telephone line from this station to another station some miles distant, where an operator is employed, for an alarm circuit without interfering with the use of the line for telephoning. This has proved not entirely satisfactory as the alarm bell has rung on several occasions when there was no lock-out at Le Grand substation. This trouble most likely has been due to the fact that it was necessary to keep this telephone line connected with other lines of the system, surges from other parts of the system closing the relay at the alarm end of the line. This relay was of the d.c. type and supposedly connected so as not to be affected by any a.c. surges on the line. On the Los Alamos installation a 20-mile telephone line is used for the alarm and no difficulty experienced. However, this line is cut loose from the rest of the telephone system.

The automatic reclosing apparatus at Le Grand replaced an operator, thus effecting a considerable saving in cost of operation. The saving by using the air-operated mechanism for the heavy duty type circuit breakers instead of a large storage battery also was considerable.

The total cost installed of the automatic reclosing equipment at Le Grand, including the air operating mechanism, was approximately $2,100.

Los Alamos Substation

This substation is on the end of a 66-kv. line of the Midland Counties Public Service Corporation. There are three Condit D-12 15-kv., 300-amp. feeder switches at the substation. The main load on the station is oil well pumping. The station had been built for several years.

It was decided to remove the 60-kv. circuit breaker on the line side of the transformers and tie the transformer bank solid to the line. Protection for the transformers now is obtained by the line switch at Santa Maria substation 20 miles distant. CO relays were installed on this switch for overload protection.

The automatic reclosing mechanism installed on the feeder switches was of the new oscillating type which was an improved design of the former reciprocating mechanism. The scheme of operation is practically the same. The SS relays were replaced in this new layout by simple lock-out relays built specially for use with the new mechanism. The time interval between closing is one minute and the number of closures before locking out is three.

The telephone circuit from Los Alamos to Santa Maria is used as an alarm circuit. This line is run on the same poles as the transmission line. It is cut free from the rest of the telephone system at Santa Maria. Insulating transformers and other protection are furnished at both ends of the line. A double-throw switch was installed at each station so the circuit could be used for alarm or phone as desired. The locking out of any one of the feeder-switch control circuits energizes the alarm circuit with 110 volts a.c. A four-volt bell sounds the alarm in the dispatcher's office at the Santa Maria substation. The dispatcher at Santa Maria can not call Los Alamos substation on the phone, but a party at Los Alamos can get the dispatcher by sending a signal over the alarm circuit. A push button was installed near the telephone at Los Alamos for this purpose. The automatic reclosing equipment did away with the necessity of employing an operator.

Fig. 7—Air-operated Kelman F-6 circuit breakers arranged for automatic reclosing, Le Grand substation.

The total cost of the automatic reclosing equipment installed was $1,600. Of this amount about $250 was used for installing the alarm.

Paso Robles Substation

A single-switch reclosing mechanism is installed here on a 2.3-kv. feeder switch supplying service to the town of Paso Robles. The mechanism installed is self-contained, requiring no relays and is very simple to set up. The circuit breaker is type K-12 15-kv., 300 amperes. The time between closures is 36 seconds and the number can be set anywhere from one to nine before locking out. Similar to other reclosing equipment, an alarm is energized when the mechanism locks out.

The operator at this station was released for other duties around the town when the equipment was installed.

The cost of the reclosing equipment including labor of installing was only $450.

Three types of reclosing equipment have been used in the above installations. A more detailed description

of this apparatus and its operation is given in the following paragraphs.

Gang-Operating Reclosing Mechanism

This reclosing mechanism will automatically reclose any number of switches up to twelve and is arranged so that should more than one switch trip out at once, no two will be reclosed at the same time. The number of times that a switch will be reclosed, should it trip out repeatedly due to persistent trouble, is optional up to five. Time intervals between closures of 108, 54 or 27 seconds also are optional. If trouble persists after a switch has been closed its predetermined number of times the switch is locked out of the automatic control and an alarm circuit energized. Any switch or switches can be operated by hand if desired, the automatic feature in no way interfering with hand operation. Any spacing of switch handles, from 7 in. on centers up can be taken care of.

All parts are of the sturdiest possible construction and should prove absolutely trouble-proof indefinitely under the most severe operating conditions. All contacts have more than sufficient capacity to handle their loads and one 0.5-kw. transformer is ample to furnish power for the entire installation. About 0.5 kw. also is sufficient, when mechanism is operated by direct current.

This reclosing mechanism consists of the driving engine, oscillating shaft, one magnetic clutch for each oil switch and a panel board. The driving engine consists of a ½-hp., heavy-duty, single-phase motor mounted on a rugged cast iron base on which also is mounted the necessary reduction gears and timing contacts. A heavy sheet-metal cover entirely encloses this assembly with only the driving shaft extending. Thic complete unit can be mounted on or under the floor.

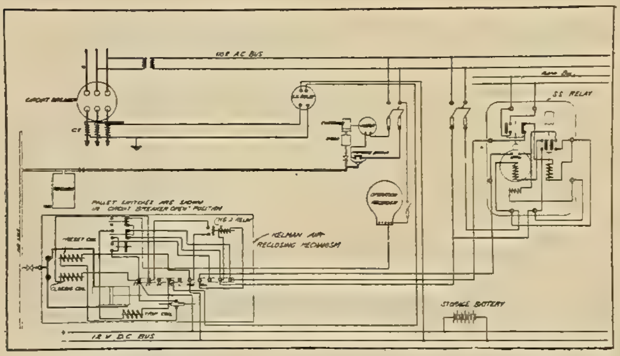


Fig. 8—Wiring scheme for adapting air-operated circuit breakers to control by automatic reclosing mechanisms, Le Grand substation.

The oscillating shaft, driven by the engine through a connecting rod, is installed parallel to the switchboard on which the oil switch handles are mounted. The oscillating shaft also can be mounted on or under the floor or attached to the pipe frame of the switchboard itself. A rod from each oil switch handle extends down to the oscillating shaft to which it is coupled through a lever arm and magnetic clutch. The lever arm is of the proper length so that when the magnetic clutch is energized the oil switch handle will be pushed to the closed position. This lever arm has over-travel at the end of its stroke with a safety device to relieve the oil switch handle and its parts of all undue strain. The closing operation itself is completed in approximately the same time as when done by hand, the exact time being 0.35 sec.

On the panel board are mounted a knife switch for cutting the reclosing mechanism in or out of operation, a latching relay for automatically starting and stopping the engine motor at the proper times and one lock-out relay for each oil switch. The latching relay starts and stops the driving engine through timing contacts driven by the motor gearing. If any oil switch reopens due to persistent overload or short after it has been reclosed the predetermined number of times it is cut out from the automatic control by the lock-out relay which also energizes an alarm circuit.

Operation

A pallet switch is connected mechanically to each oil switch on the back of the switchboard so that when an oil switch trips out it automatically closes its pallet switch, starting the driving-engine motor through the latching relay on the panel board. The engine then rocks the oscillating shaft on which the magnet clutches are mounted. At the predetermined time interval the magnetic clutch is energized and its solenoid, by pulling up its plunger, locks the oil switch handle and its lever arm to the oscillating shaft and the oil switch handle is closed once. If the oil switch stays closed the entire reclosing mechanism operates idly for a short period and shuts down at the end of its cycle, but if the trouble persists and the oil switch opens each time it is closed (for the predetermined number of times) its lock-out relay on the panel board cuts the oil switch out from the automatic control and closes an alarm circuit. This does not in any way interfere with the automatic operation of the balance of the oil switches. When the alarm is answered the lock-out relay knob is pushed down half way to its first stop, thus shutting off the alarm. After the trouble has been cleared from the line the oil switch is closed by hand and the lockout relay knob pushed down all the way, which resets it, and everything is ready to operate as at first.

By the addition of an operation counter it is possible to record the number of times each oil switch has opened and been closed. This can be done in two ways,

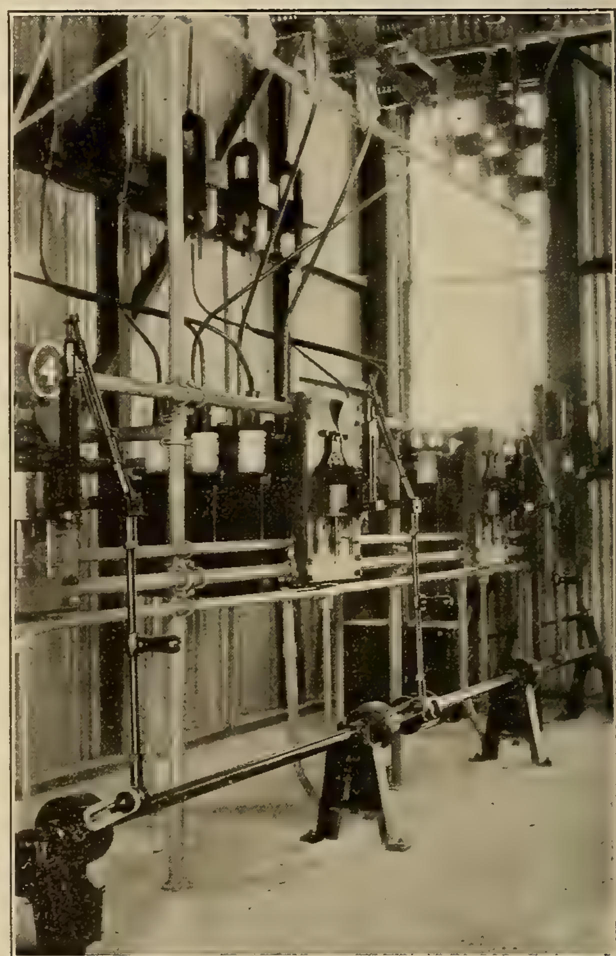


Fig. 9—Type S-2 automatic reclosing mechanism as installed at Los Alamos substation.

either by mechanically connecting a ratchet counter to the oil switch handle or by installing a multiple-pen (one pen to each switch) electrical operation recorder.

On checking up in several instances it has been found that four man-days is ample for the setting up and complete installation (floor mounting) of this reclosing mechanism controlling three oil switches.

Single-Switch Reclosing Mechanism

This reclosing mechanism is for application to single oil switches and will close any switch within the limits of its power. The closing effort is 1,500 in. lb. at the shaft. This closing effort as given is the minimum effort on the shaft when the oil switch is closed. The

mechanism also can be furnished with a minimum effort of 1,000 or 500 in. lb.

The mechanism functions by means of a ¼-hp. single-phase motor compressing coil springs which are released by a cam. When the springs are in their fully compressed position they are under 390 lb. compression. In their fully expanded position they are still under a pressure of 200 lb.

The shape of the cam releasing the springs governs the time interval consumed in moving the switch handle from open to closed position. In the mechanism as regularly furnished this is such as to give a positive closure of the oil switch without violence, but it can be furnished so as to give practically instantaneous action or a delayed action of several seconds.

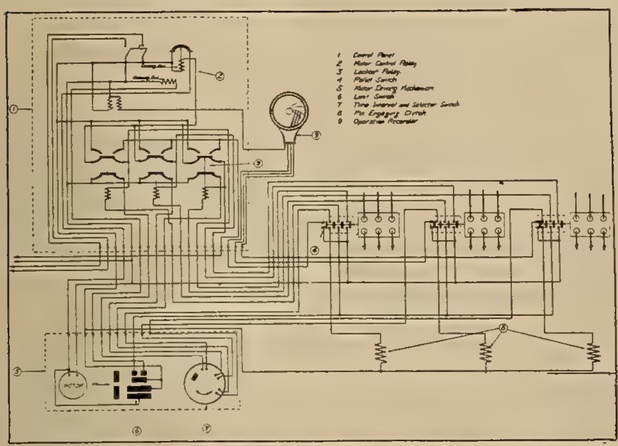


Fig. 10—Wiring diagram for S-2 automatic reclosing mechanism such as that installed at Los Alamos substation.

The number of closings before the mechanism locks out can be anything from one to nine, with time intervals of 4, 5, 9, 18, 36 or 72 seconds between closings.

Power for operation can be obtained from a 200-watt potential transformer. The entire mechanism is enclosed in an iron case 12 x 12 x 14 in. and it can be installed in the back, front or under the switchboard.

The cycle of operation is as follows: The oil switch trips out thereby closing its pallet switch which starts the reclosing mechanism. After a predetermined interval the oil switch is closed and if it stays closed the reclosing mechanism will shut down. If the oil switch trips out again the reclosing mechanism will continue to operate until the oil switch either stays closed or the predetermined number of closings have been tried. The oil switch then is locked out and an alarm circuit energized. When the trouble is cleared the mechanism is cut into service again by pressing down a reset lever.

Installation is extremely simple, merely calling for attaching the pallet switch, running three wires to the mechanism and anchoring it to the floor with four bolts or lag screws.

Automatic Switch-Reclosing Relay

This relay is for application to installations of electrically or air operated (remote controlled) oil switches. The result is that any of the oil switches that trip out are automatically reclosed. Installation merely calls for wires to be run from the oil switch control circuit on the switch board to relay. The existing method of operation is in no way interfered with.

Sequence of Operations

Switch trips out.

Relay starts to operate.

After predetermined time interval relay closes remote control circuit and switch is reset.

Relay returns to starting position if switch stays closed.

Relay does not return to starting position if switch trips out after first closing, but continues to operate.

Switch again is reset by relay after another predetermined interval.

Relay returns to starting position if switch stays in or continues to operate until a predetermined number of closings of the oil switch have taken place, after which—

Relay locks out, closes an alarm circuit and prevents switch on which trouble persists from closing again. Relay can be reset to starting position by hand and switch closed after trouble causing oil switch to open has been removed.

Adjustment of Relay for Number of Closings and Time Intervals

The timing disc on the relay takes six minutes to make one revolution. Near the edge of the disc are 24 holes equally spaced. These holes are made to receive

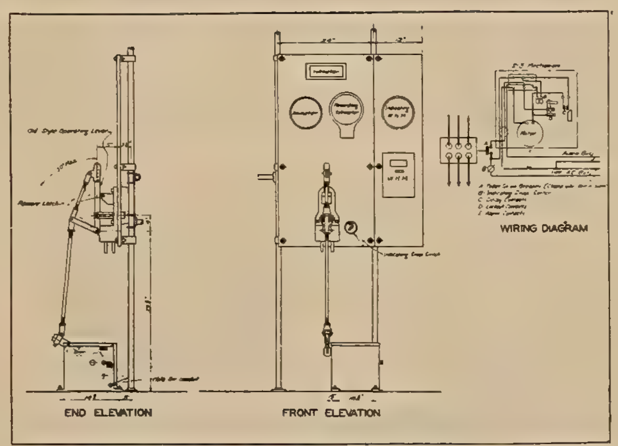


Fig. 11—General layout of single-switch, type S-3 automatic reclosing mechanism such as that installed at Paso Robles substation.

the moving contact pins. The time required for the disc to travel the distance between two of these holes is 15 seconds so any time between closings can be obtained by 15-sec. intervals or their multiple, up to six minutes. One of these holes is made into a slot for the lock-out, and by the moving of a stop pin on the disc to its proper position the relay can be made to lock out after any predetermined number of closings.

Detailed Description of Operation

(1) Operation when the trouble causing oil switch to trip is due to temporary overload or short, which trouble is cleared before the switch automatically is reclosed.

Oil switch 1 (Fig. 1) opens. Pallet switch 2 (Fig. 1) which is mechanically connected to switch 1 closes contacts bb′ (Fig. 1) energizing solenoid 4 (Fig. 1) through lock-out contacts 3 (Fig. 1) which normally are closed. Raising of solenoid plunger 5 (Fig. 1) closes contacts 6 and 7 (Fig. 1). Closing of contacts 6 puts d.c. on contacts 8 and 8′ (Fig. 1), and also energizes clutch magnet 9 (Fig. 1.) Energizing of magnet 9 pulls pinion 10 (Fig. 3) in mash with gear 11 (Fig. 3) which is connected to same shaft as disc 12 (Fig. 1). The closing of contacts 7(Fig. 1) starts motor 13 (Fig. 1) which rotates disc 12 through the gear train. When moving contact 14a (Fig. 1) reaches and makes contact across contacts 8 and 8′ (Fig. 1) the closing-circuit auxiliary relay 17 (Fig. 1) is energized and the oil switch will close. Pallet switch contacts bb′ (Fig. 1) will be opened, solenoid 4 (Fig. 1) de-energized and plunger 5 (Fig. 1) will start to drop. The downward movement of the plunger is retarded by the action of air dashpot 18 (Fig. 3.) This delay is adjustable for time. When plunger 5 reaches its lowest point of travel contacts 6 and 7 (Fig. 1) will be opened, motor 13 stopped, clutch 9 de-energized, pinion 10 unmeshed from gear 11 (Fig. 3) by action of spring 19 (Fig. 3). Disc 12 (Fig. 1) will then return to its starting position by action of spring 20 (Fig. 4), pin 21 (Fig. 4) acting as a stop. The tension on spring 20 (Fig. 4) and contacts 8 and 8′ (Fig. 1) are adjusted easily.

(2) When trouble stays on line longer than period required for first reclosing of oil switch:

Oil switch will trip out again. The delay of plunger 5 (Fig. 1) in dropping due to action of dashpot 18 (Fig. 1) will prevent contacts 6 and 7 (Fig. 1) from opening as pallet switch contacts bb′ will close as oil switch trips out and solenoid 4 (Fig. 1) again energized; plunger 5 will rise again to uppermost position. Disc 12 (Fig. 1) will not have stopped rotating but will continue to rotate until contact is made across 8 and 8′

(Fig. 1) by moving contact 14b (Fig. 1), when oil switch again will reclose. If the oil switch stays closed the relay will reset as explained in operation 1. If the switch immediately trips out again the relay will continue to function as outlined in operation 2.

(3) Trouble still is on line after predetermined number of closings of oil switch have taken place:

Disc 12 (Fig. 1) will have rotated until last moving contact has passed stationary contacts 8 and 8′ (Fig. 1), and oil switch has been closed the prescribed number of times and tripped out after each reclosing. Roller 23 (Fig. 2) then will drop into slot 22 (Fig. 2). Lock-out contact 3 (Fig. 1) then will open, de-energizing solenoid 4 (Fig. 1). Contacts 6 and 7 will be opened, motor 13 stopped and gear 11 and pinion 10 unmeshed (Fig. 3). Contact 24 (Fig. 1) will close and energize alarm circuit.

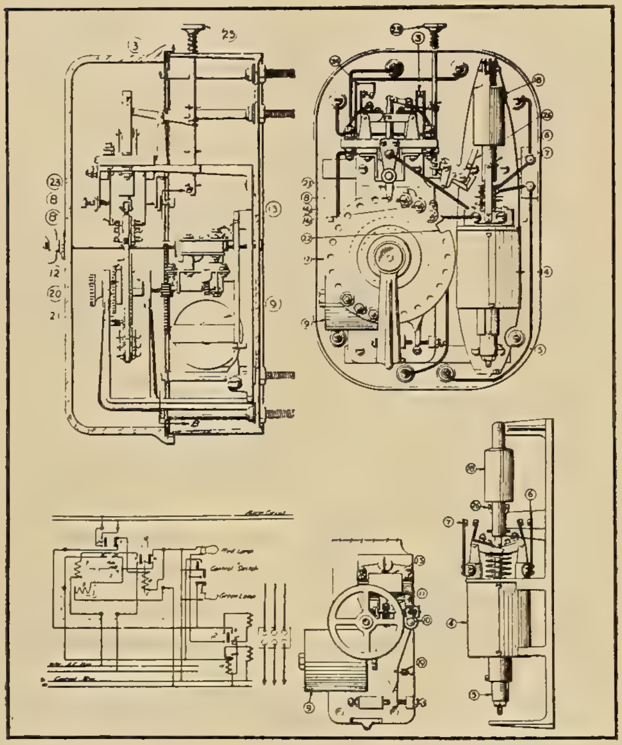


Fig. 12—Automatic switch-reclosing relay. [Referred to on page 485 as Fig. 1.]

(4) Trouble on line cleared and relay reset:

After trouble on line is cleared relay may be reset by pushing down on reset button 25 (Fig. 2) which raises roller 23 out of slot 22 allowing disc 12 (Fig. 2) to return to starting position. Contact 3 (Fig. 1) will close and contact 24 (Fig. 1) open. Bell crank 26 (Fig. 2) holds down plunger 5 so that contact points 8 and 8′ (Fig. 1) will not be energized while disc is returning, which movement is completed in less than one second. When pressure is removed from reset button relay will be in its starting position again and ready to operate as before.

Operating Duty

At present the operating duty on the automatic reclosing circuit breakers on the San Joaquin system are even time intervals. The number of reclosures being in all cases three and the operating duty varying from 15-15-15 seconds to 120-120-120 seconds. It is possible to vary this operating duty to any time interval and number of reclosures deemed advisable.

Maintenance and Inspection

Reports on maintenance and inspection costs of the automatic substations show that these costs are less for the automatic substation than for the manually operated ones. This is due mainly to the fact that the expenses connected with the needs of an operator are done away with. Inspection of the automatic substations is made once a month, the same as the manually operated substations.

Summary

Table I shows the automatic substations in service up to November, 1924. The record of operation given is taken over a period covering the first eight months of 1924.

TABLE I

Substation	Kva., capacity	Sec. volts	Feeders	Months in service	Kick-outs	Lock-outs	Per cent correct operation
Shafter......	4,500	11,000	4	36	29	1	100
Los Banos...	2,000	11,000	4	20	39	1	98.5
Crane Valley.	1,500	20,000	1	20	36	3	100
Lompoc......	1,500	11,000	4	16	73	12	100
Calif. Ave....	18,000	11,000	10	12	56	8	100
*LeGrand.....	1,500	11,000	4	9	†	†	
Los Alamos..	600	11,000	3	8	†	†	
Paso Robles..	1,500	2,300	1	4	†	†	

*Capacity since increased to 7,500 k. v. a.
†No record.

In three years of service only three failures of operation of the automatic reclosing switches have been experienced. These troubles were due to a burnt out coil, failure of an air-compressor switch and a weak contact spring.

The policy of the San Joaquin Light & Power Corporation is to make automatic such stations as seem adaptable to this type of operation. So far the majority of automatic substations on the system are stations on the end of stub 60-kv. lines where there is no 60-kv. or 110-kv. switching equipment with the exception of a line switch. Two of the automatic stations are on 60-kv. loops and plans now are under way for two stations where there will be 110-kv. and 60-kv. switch equipment. The plan is to make the feeder switches automatic reclosing and to have one resident operator to handle any high-tension switching.

The experience of this company has shown that the automatic substation not only is a means of improving service, but has reduced considerably costs of operation.

At new substations built in out of town locations where if not made automatic it would be necessary to build a cottage, garage and tank-house for an operator, the additional cost of making the substation automatic is less than half the cost of the building.

Design and Operation Features of Automatic Substations

By R. B. KELLOGG, H. T. SUTCLIFFE and B. D. DEXTER

FOLLOWING are included descriptions of automatic features to be installed in two new substations of this company which are of interest chiefly in that they incorporate features new to Pacific Coast practice. Subsequent to a description of these two stations is a brief description of the automatic regulation on the 11-kv. output of the company's Mountain View substation. This covers the original installation which was put in to regulate the voltage on the secondary side of a bank of three 1,500-kva. transformers, stepping from 60 kv. grounded Y to 11 kv. grounded Y. Since this original installation there has been installed an additional bank of the same capacity, connected in multiple with the first bank. Additional tap-changing switches or regulating heads were installed and connected up to the existing equipment so that the automatic feature applies to the entire output. Although this company has numerous installations where secondary regulation is secured by means of hand-operated tap-changing switches for changing transformer taps under load, the equipment at the Mountain View substation is the only one at present in operation on our system where the regulation is handled automatically.

Automatic Features to Be Installed

During the year 1925 this company will build two new automatic and unattended substations, one located in San Francisco and one in the East Bay District. These substations will incorporate many new and strictly up-to-date features which will prove interesting inasmuch as no similar installations have been made on the Pacific Coast up to this time.

Both stations have been designed for approximately the same service and will be supplied from 11-kv., 3-phase power cables feeding a double bus. The voltage is stepped from 11 kv. to 4.1 kv., 3-phase star through three single-phase, self-cooled transformers. From a 4-kv., low-tension double bus, automatic periodic reclosing distribution feeders supply the surrounding district. These feeders are regulated and operated 3-phase, 4,150 volts, star connected, four wire, with grounded neutral.

Provision is made in each station for the installation of either synchronous converters or motor generators to supply 600-volt d.c. railway service. The buildings are designed as unit type and the 11/4-kv. switchboard and generator rooms may be extended one bay at a time as the growth of load in the district warrants.

With the use of type R.O. street-lighting transformers located on the outside circuits the street lighting equipment in each station is taken care of by practically standard 4-kv. feeder equipment. This eliminates the room and additional electrical equipment formerly required for constant-current transformers in the station.

The ultimate capacity of each station will be approximately 15,000 kva. or 4-kv. distribution, 4,000 kva. of 600-volt d.c. railway service and from three to six street-lighting circuits of 400 kva. each.

Station "L," San Francisco

The following electrical equipment will be installed in this station to take care of the present requirements:

One 11-kv. double-bus and switch structure, one 3-phase, 11/4-kv. self-cooled transformer bank and one unit-type, 4-kv. double-bus and switch structure. The 4-kv. distribution circuits and street-lighting circuits are periodic automatic reclosing.

Supervisory Control—All of the switching in this station is accomplished by the use of supervisory control. The dispatcher's office is located at Station "H," Bay Shore, approximately four miles from Station "L." The supervisory system installed is that known as the distributor type manufactured by the General Electric Company.

The dispatcher will have control keys at his switchboard and may open and close the oil switches at Station "L," receiving lamp indication that the operation has been completed. Each control unit consists of a control key, one red lamp indicating the oil switch is closed, one green lamp indicating the oil switch is open, and one white lamp which will light whenever the indicated position of the oil switch does not correspond with the position of the key. This company has departed somewhat from the standard arrangement of control switchboard in the dispatcher's office and has planned to install a dummy bus in addition to the lamp and key units. This has been done to simplify the switching and to convey to the dispatcher the exact bus arrangement.

Another departure from the standard arrangement of supervisory control has been the addition of a polarized relay for the control of the automatic-reclosing feeder equipments. This relay automatically cuts out the reclosing feature when the dispatcher opens the oil switch, thus preventing a reclosure after the switch has been opened by supervisory control. Should the feeder oil switch open four times and lock out the dispatcher is unable to reclose this oil switch and it is necessary for an attendant to visit the substation, investigate the trouble and reset the lock-out relay. The supervisory relays and control are installed for a single 4-kv. bus only. Transfer from bus to bus is accomplished only manually by means of double-throw transfer switches installed in the substation. This was done to simplify the adaption of supervisory control for a double-bus system where automatic reclosing is employed.

Although there will be no attendant, the outlying station will be equipped with a complete switchboard and control for manual electric operation of all the switches. It was estimated that this could be done at comparatively low expense and would prove a great advantage in cases of emergency such as a break in the interconnecting supervisory wires between the dispatcher's substation and the outlying substation.

Other than that described above, the supervisory system is the manufacturer's standard arrangement and will be described briefly.

The equipment at the dispatcher's office (Station "H") consists of an apparatus cabinet in which is mounted the following:

A distributor with driving motor and polarized relays. This cabinet is wired completely so that the system easily may be extended to supervise 50 devices although only 26 devices (oil switches, doors, control charging sets, etc.) will be controlled at the present time. The relays are mounted in spring clips so that they may be installed easily at any time.

One set of control keys, lamps, phasing lamps, bell, master key, etc., for the control switchboard.

One 120-volt storage battery with middle tap, 60-0-60 volts, with 250-watt trickle-charging motor-generator set and automatic control devices.

One 24-volt storage battery and tungar charging equipment.

The equipment at the outlying station (Station "L") is comprised of the following:

One apparatus cabinet with distributor and relays similar to the one in the dispatcher's station.

One 120-volt storage battery and automatic trickle-charging motor-generator set together with auxiliary switches and detail devices constitute the equipment. The trip-free contactors for relaying the signal to the oil switches and the transfer switches for manual or supervisory control are located on the control panels for each individual oil switch. With this feature the identification of each device with the oil switch which it controls is simplified.

The system operates over four metallic conductors, No. 19 B. & S. gage between stations and in this case will consist of a paper-insulated, lead-covered cable installed the entire distance.

The two distributors revolve continuously and are held at the same speed by a synchronizing device. To perform a desired operation the operator turns the key controlling the necessary apparatus and closes the master operating switch. As soon as this operation is completed the lamp associated with the key turned is lighted, indicating either the open or closed position of the switch in the outlying station. The maximum time between the turning of the key and the return signal (lighting of the lamp) is ten seconds. No impulses are sent out until the master switch is closed. This feature allows a mistake to be corrected before the signal is sent out. When any change has taken place in the position of the oil switches or other devices in the outlying station for other causes beyond the dispatcher's control, indication is given at the dispatcher's office by a change in the indicating lamps and attention is called by the ringing of a bell.

Substaton "E," Piedmont

The other substation, known as Station "E," is much the same in general arrangement as Station "L" in San Francisco except that no 4-kv. distribution circuits will be installed at this time, although the conduit is provided and room allowed for transformers, regulators, and swtching equipment which will be installed as soon as the load conditions demand. This station is located in the residence district and will have an attractive outside appearance and is designed for noiseless operation.

In this station two 1,000-kw. synchronous motor-generator sets, 600 volts d.c. and 11-kv., 3-phase, 60-cycle a.c. will be installed for railway service. These two units will be equipped for complete automatic operation both a.c. and d.c. without manual or supervisory control except for the start and stop operation. In addition to the automatic equipment, supervisory control similar to the system used at Station "L" in San Francisco will be installed for control of the 11-kv. bus oil switches and for the starting and stopping operation of the motor-generator ets. The control switchboard for the dispatcher will be located in Station "L" in Oakland and is similar to that at Station "H" in San Francisco. The d.c. railway feeder circuits will be of the automatic reclosing type with load-limiting resistor and high-speed breaker equipment.

The necessary relays and devices for remote load indication of the two motor-generator sets will be installed at Station "E" and Station "L" to enable the dispatcher to read the load in a.c. amperes on either machine at any time. This is necessary to enable the dispatcher to determine the necessary adjustment of the load and the proper time to stop or start the two motor-generators.

Supervisory stop and start control and lamp indication will be installed for the small motors operating the ventilating fans, battery charging sets and also lamp indication of the open and closed position of the substation door.

In the design of these substations, considering the fact that new and special features have been employed and that there will be no operators, the thought of outstanding importance has been simplicity of wiring and of the location of the different devices. Provision has been made for the testing and tracing of circuit and no interlocks or "trick" connections have been used which

would confuse the maintenance man in locating trouble. Experience has indicated that a complicated station, however successful in its operation, very often proves a menace in case of a loose connection or temporary failure of any of the controlling devices when they are difficult to locate or not properly marked, and the wiring is so complex that a comprehensive identification is impossible when the time is short and service must be restored in lieu of a service penalty.

A modern substation should have plenty of light either day or night and be well ventilated and have convenient aisle spaces. Electrical and mechanical relay apparatus and wiring should be designed to provide suitable protection for satisfactory unattended operation and yet readily be identified and understood. With this accomplished and with simplicty the predominant factor so that relays and wiring may readily be traced and repaired in case of trouble without necessitating an expert, the station will progress from its inception to final turn over with reduced cost and greater speed. Last but not least, when it becomes an operating property, successful operation, fewer outages and reputable continuity of service will result.

Switchboard Instruments and Wiring

By ROY MARTINDALE

THE new Hollywood substation of the Los Angeles Bureau of Power and Light has its switchboard completely equipped with the new rectangular-type instruments. At first glance these instruments look rather odd, but this is merely a matter of having been accustomed to round instruments. Black scales with white markings are used on all instruments on this switchboard.

One particular feature of this board is the use of the three-element ammeter in place of the former practice of a single ammeter and ammeter switch. The actual cost of the three-element meter is but little if any more than the cost of one meter and ammeter switch and their wiring.

By the use of the three-element meter the amount of wiring on distribution feeder panels is reduced at least 25 per cent over the former practice. The meter panel for four 4.4-kv. feeders with ammeters, watt meters and relays now has only fourteen vertical wires. Fig. 1 will give a good idea of the general appearance of this switchboard.

It was not possible to take full advantage of the space-saving features of these instruments because they are adapted to 24-in. panels and the ebony-asbestos panel material used comes in 21- and 42-in. widths.

Design of Automatic Regulator Heads

By J. L. LANDON

AUTOMATIC control on regulator heads first was put into operation on the Pacific Gas and Electric Company system in 1922. At that time there were in service at the company's Mountain View substation three 1,500-kva. transformers, 60/11-kv., Y-connected and grounded both sides, with regulating transformers on the secondary side to give 10 per cent buck or boost in five equal steps. These regulating transformers were

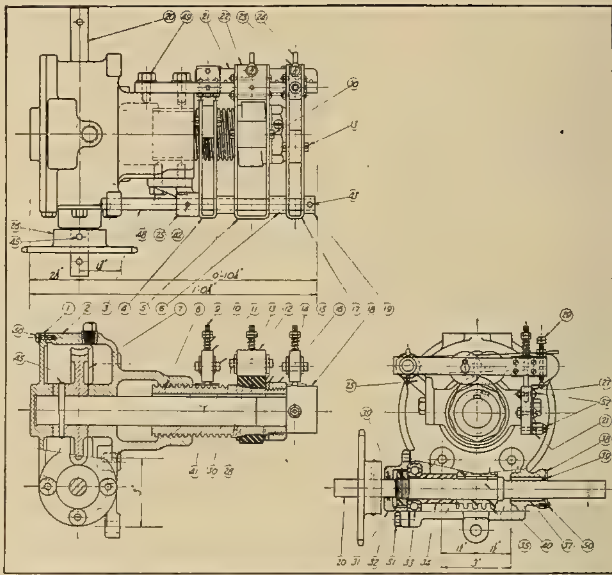


Fig. 1—Showing the assembly of regulator head driving mechanism and cam switches.

hand-controlled, the housing containing the control mechanism standing directly in front of the transformers.

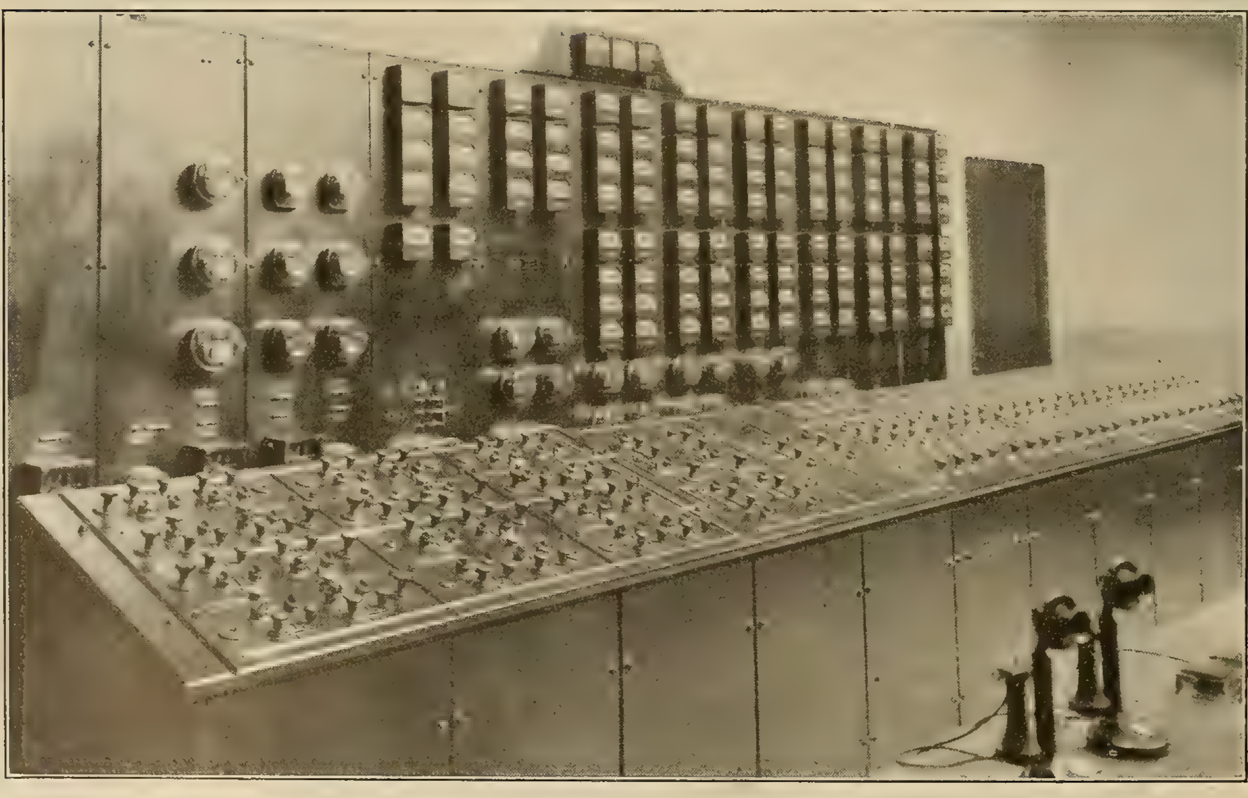


Fig. 1—Switchboard and benchboard at new Hollywood substation of Los Angeles Bureau of Power and Light.

To convert to automatic operation it was necessary to run in front of the regulator heads a jack shaft which was geared to the former hand-controlled shaft and operated by a motor. This motor operation was essentially the same as for induction voltage regulators. A primary relay controlled by a line-drop compensator operated the motor through a motor starter switch. The circuit to the motor is held closed by a timing switch which closes by a cam movement on the driving mechanism of the regulator head until the motor has completed the step change. The introduction of this switch in the circuit eliminated the possibility of the mechanism reversing operation in the middle of the step due to changing voltage conditions. In addition to the timing-switch cam there are two cam contacts which slide along the control shaft on a keyway and open up the control circuit when the maximum position in either direction is reached. Fig. 1 shows the assembly of driving mechanism and cam switches.

Description of Regulator Heads

Figure 2 shows a front and sectional elevation. The frame (1) and housing is of sheet metal reinforced with angle iron. The front and back are removable, making all parts accessible. Contactors (2) have a 500-ampere

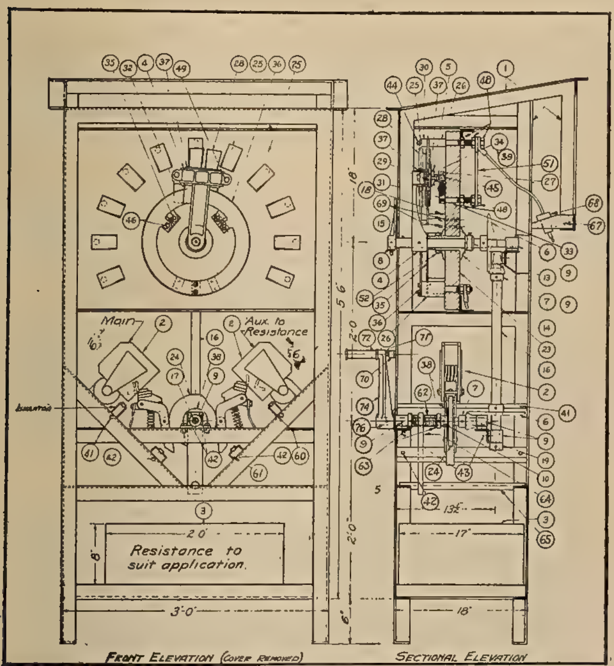


Fig. 2—Front and sectional elevation of regulator head and frame. Front elevation shows appearance with cover removed. When cover is in place contact position is indicated by a pointer arm.

capacity and are equipped with blow-out coil. The resistance (3) is mounted as shown, in the lower part of the frame. It should be of a size and resistance sufficient to give a drop equal to that of one step of the regulating winding at full load.

The contact fingers (28) are of copper clamped to a bronze arm (4) with a copper spacer between to allow a tight fit on the contact blade (25). The main (36) and auxiliary (35) collector rings are of 3/16-in. sheet copper. A brief description of the steps of operation will describe more clearly the mechanism.

Operation of Control Equipment

The operating housing with the panel containing the control equipment is shown in Fig. 3 and a diagram of connections in Fig. 4. A fluctuation in voltage, for example a decrease, will energize the primary relay which will close its contacts for raise. The circuit then is completed through the auxiliary contacts of the controls, which are closed when the main control contacts are open, through the operating coil of the main contacts closing them and through the limit switches for high voltage. (The latter normally is closed but opens when travel in that direction is at an end.) The circuit then is made through the main contactors to two phases of the motor (the third leg connecting directly to the line). This circuit also goes through

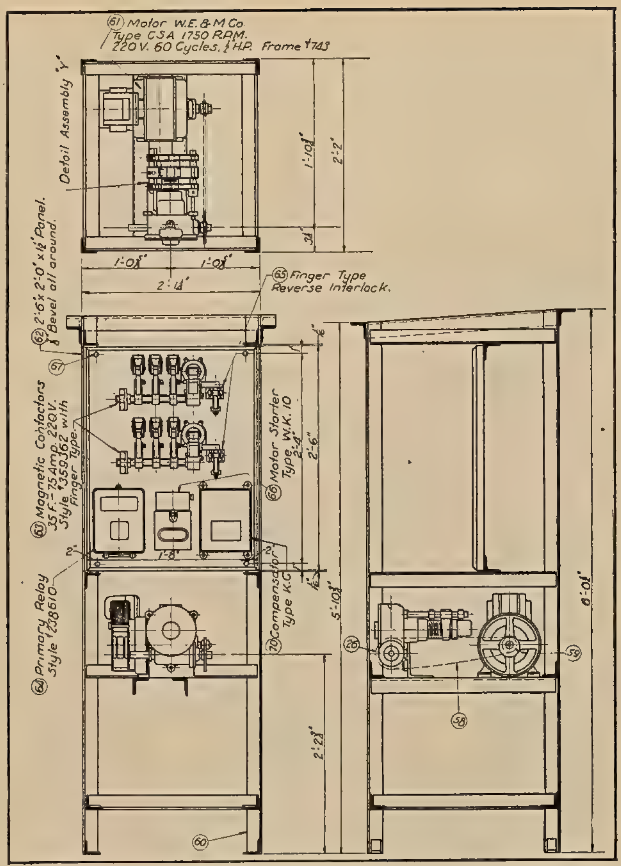


Fig. 3—Assembly of operating housing and panel containing control equipment.

the timing switch which keeps the main contacts closed until the operation is complete, shunting out the primary-relay circuit. To reverse, the same steps are taken and the reversal accomplished by crossing the two phases energizing the motor.

To summarize, there are three separate circuits in the control. The first is through the potential transformer, line-drop compensator and primary relay coil. The second is from a.c. source through motor-starter switch, through primary relay contacts, through auxiliary contacts on main relay, through energizing coil for main relay contacts and through the limit switch. The third is through motor-starter switch and main contactors to motor.

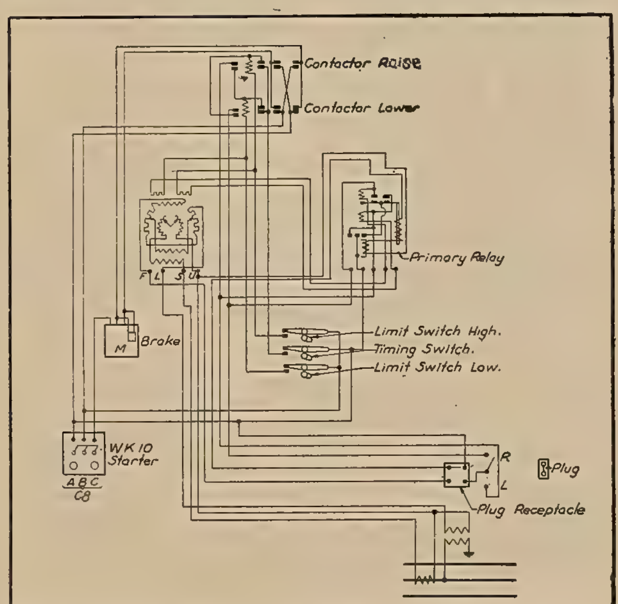


Fig. 4.—Diagram of connections of apparatus shown in Fig. 3.

There is a plug receptacle through which passes the circuit from the compensator to the primary relay coils. Removing the plug from this circuit and placing it in an adjoining receptacle cuts out the automatic control feature and makes the regulator hand controlled by a knife switch energizing the auxiliary contact circuit controlling the main-relay contacts direct.

Operation of Regulator Head.

Fig. 5 shows the diagram of connections for the regulator head and also a description of the operation. The drawing shows the main finger in position on the neutral contact block. In this position the regulating winding is cut out. The circuit is from the low side of

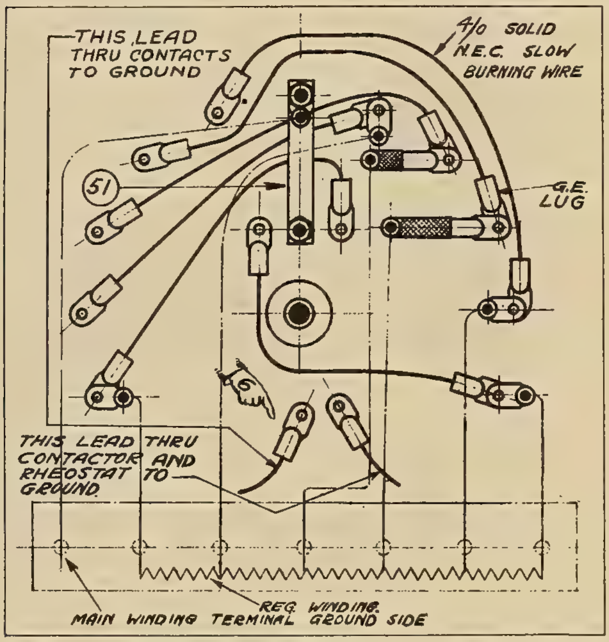


Fig. 5—Rear view of regulator head showing wiring connections.

the transformer secondary winding through the main contact finger to the outer collector ring and through the main contactor to ground. The auxiliary finger is off the contact block and the auxiliary contactor is open.

When the control circuit operates to raise the voltage one step from neutral the following is a sequence of events:

(1) Auxiliary finger makes contact with block "a".
(2) Auxiliary contact closes.
(3) Reversing switch closes at "B".
(4) Main contactor opens.
(5) Main finger breaks from neutral block.
(6) Main finger makes contact with block "a".
(7) Main contactor closes.
(8) Auxiliary contactor opens.
(9 Auxiliary finger breaks from block "a" and conditions are similar to those at starting. For every following tap, procedure same as above, except that event (3) disappears and reversing switch "B" remains closed.

It is to be noted that the break in the main and auxiliary-finger circuits is made by the contactor blow-

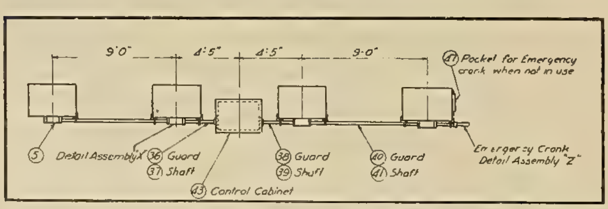


Fig. 6—Plan view of a regulator installation showing schematically the general arrangement of the control cabinet and the operating cabinets for four regulator heads.

out switches. Also to lower voltage one step starting from neutral conditions, the following is a sequence of events:

(1) Auxiliary finger makes contact with neutral block.
(2) Auxiliary contactor closes.
(3) Main contactor opens.
(4) Main finger breaks from neutral block.
(5) Reversing switch closes at "A".
(6) Main finger makes contact with block "a".
(7) Main contactor closes.
(8) Auxiliary contactor opens.
(9) Auxiliary finger breaks from neutral block and conditions are similar to those at starting. For every following tap, procedure same as above except that (5) disappears and reversing switch "A" remains closed.

This sequence is shown graphically in Fig. 5. For protection of this equipment a bell alarm circuit is connected across a section of the grids of the resistance, ringing a bell whenever the regulator operates.

General

This equipment has been almost in continuous operation since its installation. There has been but one case of trouble, which was due to the sliding fingers cutting on the collector ring and causing a heavy drag which broke two teeth out of the top pinion gear. This threw the sliding fingers out of time with the contactor switches which open circuited the load current starting an arc which did some damage to the internal parts.

Some Features of Automatic Generating Plant Design and Operation

BY R. C. DENNY

THE San Joaquin Light & Power Corporation now is operating five hydroelectric plants qualifying as semi-automatic. The generating capacity of the five plants totals 8,775 kw. in five units ranging in size from 475 to 5,000 h.p. and operating under static heads of from 45 to 405 ft. Two of these plants were entirely new developments as semi-automatic plants and employ induction generators directly coupled to reaction type turbines. The other three plants were changed over from manual operation and employ synchronous generators direct-connected to reaction turbines. Four of these plants are operated in series, effecting control of stored water. One of them makes its load-change automatically by means of a float control, while the load changes at the others are made manually at the dispatcher's orders. The fifth plant is entirely independent of any stored water; being a stream-flow plant employing float control.

Safety Features

The automatic features of these plants mainly have to do with the protecion of the apparatus against numerous things that might happen under abnormal conditions. In the plants employing synchronous generators, automatic protection is provided against overvoltage incidental to overspeed should the plant trip off the line. This is accomplished by inserting extraneous resistance in the exciter field circuit. In all plants there are overspeed devices used which function at 10 per cent overspeed to trip the governor safety latch and close the turbine gates either through the governor's operation or directly by motor-operated gearing, as in the induction generator plants.

The bearings are equipped with temperature relays which function to trip the unit off the line and shut it down in case of an overly hot bearing. Troubles either in the generator or in its cables, due to breakdown or to loss of excitation are cleared either by differentially connected relays or by directional overload relays which function to trip first the generator switch and then the field switch. The plants are protected from line troubles either by overload relays of the inverse or definite-time types, usually the former. Governor oil-pressure-system troubles cause auxiliary relays to be operated by means of pressure-operated switches, signaling the attendant. A similar scheme operates in case of governor-belt failures which in some instances would overload the plant. In practically all plants changed over to automatic operation it has been necessary to apply numerous home-made devices in the absence of standard devices. The details of two such original devices designed to effect float-control of load are described.

Load Control

The first and simpler of the two methods of float control is more applicable to plants having little or no forebay storage, in fact no forebay other than a pressure box of some sort to permit spillage incidental to loss of load. In plants of this type the problem of load control is comparatively simple because load

changes result in quick water changes and relatively quick return of the float to normal or neutral position. Referring to Fig. 1, it will be noted that the three wires from the float switch connect with the governor-control motor and its d.c. source through a thermal contactor, which device is nothing more or less than a thermostatic flasher. It is one of the substantial types on the market having heavy contacts and a capacity of 220 watts. The heating element (He) of the thermostat is connected in series with a 60-watt mazda lamp (L) at all times. This results in a continuous though negligible current consumption. The action of the control is as follows:

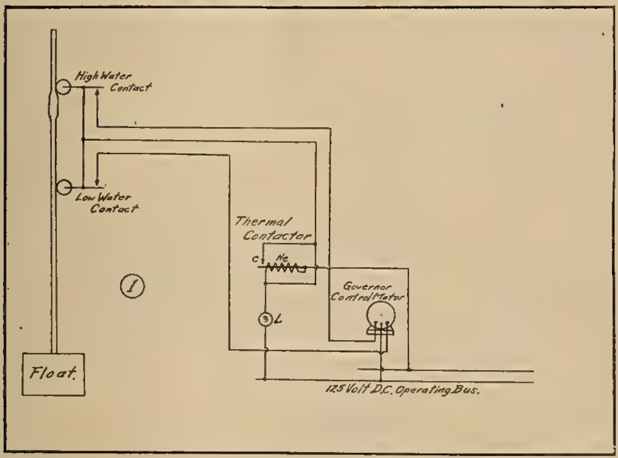


Fig. 1.—Wiring diagram of float control circuits for automatic generating plants having little or no forebay storage.

The current drawn by the lamp through (He) causes the thermocouple to expand and close the contact (C). This shunts out the heating coil and puts the full current through the lamps. The thermocouple then cools off breaking contact (C). This action is repeated continuously, the intervals of closed and open contact being in order of two and three seconds respectively which may be varied by adjustment of the contacts or by using lamps of different wattage. Consider that the high-water contact closes during an interval when contact (C) is closed. Then current will pass through the thermocouple and operate the governor control motor to pick up the load. The contact is then broken in a few seconds as already outlined and the motor stops. If not enough load has been picked up in the first interval to change the float position the motor will operate immediately on reclosure of contact (C). The operation is the same for low-water contact except that the governor-control motor is reversed causing load to be rejected.

In plants that operate on little or no storage the above scheme is very effective as one or two operations usually will be enough to cause the float switch to open. It is quite obvious however that such a scheme would not be satisfactory in forebays of any considerable capacity, as the control motor would operate so many times before the water could draw down or rise enough to break contact that the governor would greatly overtravel one way or the other. Therefore the method shown in Fig. 2 was devised to give greater time intervals than was possible with any thermal device. Relays L, H, I and D are standard plunger-type relays of well known manufacture, all of current-operated type, three-ampere rating. All except (D) are of the instantaneous-type relay, (I) having a third contact and flexible connection to the plunger contact. (D) is of the definite-time-delay type. The long-time-delay relay also is standard although not in extensive use owing to the rather special nature of its applications. The explanation of this method of operation follows:

Consider that the high-water contact closes. This puts a.c. on relays (H) and (D). Relay (H) picks up, instantly putting d.c. on the governor-control motor through contact (A) to pick up some load. Obviously the motor must not operate too long, or far too much load would be picked up. Relay (D) in the meantime is coming up to close its contacts in a definite time of two or three seconds or whatever is found to be the proper interval. Immediately upon closing its contacts three things are accomplished simultaneously. Energy is maintained on (I) through contact (B) and flexible connection entirely independent of relay (D), and holds in. Relay (D) is shunted out and opens, taking its normal position. The long-time-delay relay starts due to the action of the synchronous motor which is energized through contact (B). Contact (A) opens at once and stops the governor control motor. All this happens within two or three seconds after the float first contacts.

The motor (M) continues to operate moving the arm (Rm) around for a definite time of five or ten minutes or anything up to 25 minues that may be found necessary to allow the forebay to draw down. At the end of this interval, contact (B) is opened by the lever (Rm) and, provided that the high-water contact has broken in the meantime, motor (M) stops and the lever (Rm) resets. Also relay (I) is de-energized, taking its normal position and breaking the shunt around relay (D). However, if not enough load had been picked up and the high-water contact still is maintained, the governor control motor will start immediately when contact (A) recloses and relay (D), receiving energy immediately on having its shunt broken begins to time the operation as before. The operation for low-water contact is just the same except that relay (L) is operated instead of (H) to reverse the governor-control motor to reject load.

Of course it is possible to rebuild clock mechanisms to accomplish results similar to those obtained through the methods just reviewed. However, it is very doubtful if the same ease of control over the short and long-time delays could be had without getting into quite a complicated and expensive machine. The manufacturers rapidly are coming to realize the need of such devices and it soon will be possible to change over a plant and use all standard devices.

Underlying Reasons for Changes

The principal reason for changing over the three synchronous unit plants was to cut down operating expenses by eliminating two operators at each plant, and the reason for the two induction unit plants was to so simplify operations that the one reservoir attendant at each place could safely assume the responsibility of supervising operations. All these plants operate at a very low yearly load factor owing either to their intermittent or seasonal operation in connection with the use and control of stored water or to variable stream flow. For these reasons the operation could not be economically effected unless the labor charge was reduced to a very minimum. It was felt necessary to keep one man at each plant on account of the considerable property at each place to be looked after, therefore the semi-automatic nature of the installations. Although the man at each plant is paid more to assume the entire responsibility the net saving in labor

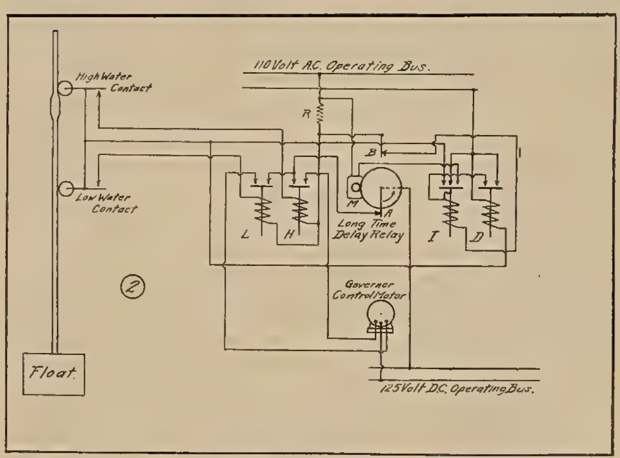


Fig. 2.—Wiring diagram of float control circuits for automatic generating plants having forebay storage.

is $205 per month per station or $12,300 per year for the five plants. In regard to the time of so called expert supervision in connection with such plants as is often heard mentioned, it may be said that the operator is so instructed as to be able to keep the various relays and devices in operating condition which is more in the order of keeping contacts clean, and battery charged

up than anything of a highly technical nature. Expert supervision is therefore a negligible percentage of the kw-hr. cost.

Supervisory Control

Owing to the fact that there is a man stationed at each of these plants there is no occasion for the use of any entire scheme of remote supervisory control. The success of such a control system is dependent on the infallibility of the control circuits. As these are subject to the same difficulties as the transmission lines and which in turn affect the plants it is reasonable to expect that the control would on many occasions be out of order just at the time when most needed. If the plants were of an entirely automatic nature, then remote supervisory control would be necessary and cable circuits probably justified. There is one case however, where water is admitted to a ditch by remote operation of gates in the dam and the height of water in the ditch indicated back to the operator a distance of a mile by means of a standard long distance pressure indicating system. In another case the output of one plant is indicated at another plant where operators are on duty constantly. In this case the distance is perhaps a half mile and the indication by a wattmeter where the output is stepped up to transmission voltage at the larger plant. There is no control involved, merely an indication of load and the load changes that the remote plant makes automatically. These are the only cases which in any way approach remote control or supervision of operation in connection with the semi-automatic plants.

Ground-Current Control and Station Electrical Grounds

By F. H. MAYER, D. J. KENNELY and H. L. SAMPSON

THE question of correct design and installation of station grounds is misunderstood more generally than any other electrical term used in connection with station layout. There is a wide difference of opinion in what constitutes a good ground. Most articles and discussions heretofore have dealt principally on surface area of plates or rods necessary for contact with the earth and a special effort usually was set forth to show the best method and material to be used in order to obtain the least possible resistance from conductor to earth.

It is recognized that these facts all are important, but in view of the fact that these points have been discussed thoroughly, it was thought not necessary to discuss this phase of the subject any further, but to rather take up the matter of station-ground layout as it applies to Southern California Edison power houses and substations.

There has been published very little on grounds and control of stray currents in station layout and therefore, as a result of such a condition, many stations are being designed and installed without being given the consideration that this branch of design should have. Very often we read where instruments on the switchboard were burned out or some part of the building or the plumbing was damaged to considerable extent, all as the result of some electrical failure. This in our judgment can be avoided to a very large extent, at least it can be confined to the area in which the failure occurred if the correct design is adopted. This naturally suggests just what constitutes a good ground layout.

As the result of experience with the 220-kv. ground layout and also as a result of the methods used on our substation ground-control system, it is the opinion that in order to have a good ground layout there must be five points satisfied, namely:

(1) Will it protect human life?
(2) Will it protect vital parts of the electrical equipment, such as switchboard equipment, etc.?
(3) Will it permit the equipment installed to function as it is supposed to, for example lightning arresters and relays?
(4) Will it keep the potential in a station down in relation to other stations in case of a flash-over to ground?
(5) Will it protect the steel and concrete in the building where conductors of heavy carrying capacity are supported on the building structure?

It is believed that when considering the above points there are three fundamental considerations to be taken into account:

(1) The current on the occurrence of an accidental ground always passes or tends to pass from the point of failure to the generator or transformer neutral, or a point of weaker insulation on the other phases.
(2) The potential gradient of an energized conductor when placed in the ground possibly may be quite pronounced.
(3) The current will seek the path of least resistance.

In order to satisfy the first consideration, any flashover from phase to ground, foreign to the station, will have its circuit satisfied if the neutral of the power transformer is tied to pipes or embedded plates that are in-

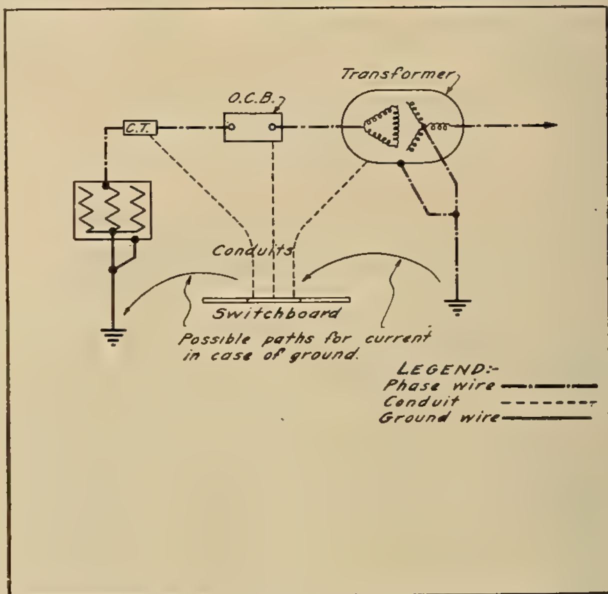


Fig. 1—Schematic wiring diagram of condenser or generator and power transformer each with neutral grounded to earth. No metallic control.

serted in permanent moisture. For flashover near the station or on the station proper, due to the difficulty of grounding each piece of equipment to the earth, it was found more economical to tie each piece of equipment to the neutral or transformer case by a metallic conductor. This introduces a lower resistance path from any point of possible failure to the neutral than is possible through the earth's surface. It was found in ground layouts that when a metallic path was formed from various parts of the rack structure to the ground neutral there was a considerable net work of copper. When this net work was properly placed it was possible to take care of the second consideration. In all layouts care is taken that immediately below steel structures, such as braces, a conductor is embedded in the earth's surface. Any steel such as columns is similarly treated.

For the third consideration, so far as the outdoor racks are concerned, this condition has been satisfied provided the net work has sufficient carrying capacity to reduce the resistance to the required amount. However, on substation or power house layouts where there are several racks or a rack and a building precautions should be taken to shunt out the switchboard that controls the various groups with conductors of extremely low resistance thus discouraging any current from going through the vital part of the station.

Figure 1 shows a single line diagram of the condenser or generator with its individual transformer bank and with the neutral of the condenser, generator and transformer grounded to the earth. The dotted line represents secondary wiring such as current-transformer secondaries, temperature alarms, and other circuits. Upon the occurrence of a failure on the low side of the transformer experience has shown that in order to satisfy the circuit when a station is grounded similar to this, current will flow from the failure to the case of the transformer, through the secondary wiring or the conduit, through the switchboard and back to the

generator or condenser. This probably happens for the reason that the resistance through the ground path is the higher of the two.

Figure 2 shows a single line diagram with the installation which is typical of recent practice on unit installations such as occurs at Laguna Bell, Eagle Rock and Big Creek No. 3 and also for the fourth unit at both power house No. 1 and No. 2. The conductor, which is tied to the neutral of the condenser or generator, is run parallel to the main leads and each insulator supporting the main leads is mounted on steel inserts. These inserts are bonded to this heavy cable, which extends the full length of generator or condenser leads,

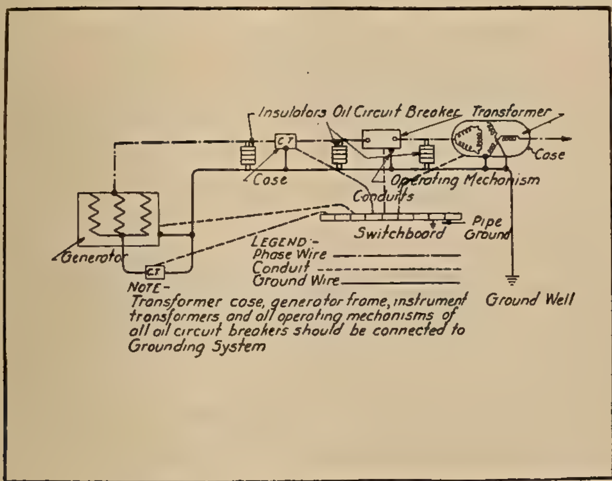


Fig. 2—Schematic wiring diagram of condenser or generator and power transformer each with neutral tied to metallic control.

and is tied to the frame of the generator and to the case of the transformer. This conductor usually is about 75 per cent of the carrying capacity of the generator lead. It is true that a lower carrying capacity would carry the current during the short time of flow at the time of trouble, but if a high resistance were used there might be sufficient potential developed to cause enough current to flow through the switchboard to do considerable damage. There were several cases of trouble, one at Laguna Bell and one at Big Creek No. 3, where an insulator failed. In every case the differential relays opened the circuit breakers and the damage was very slight. At Laguna Bell the ground cable was burned slightly and the walls blackened as a result of the arc. At Big Creek No. 3, six minutes

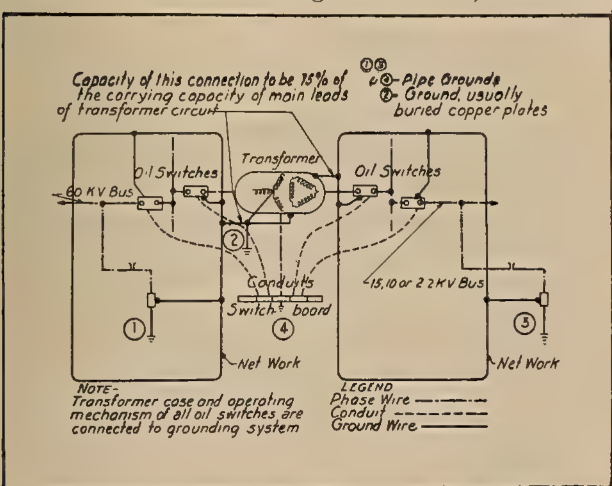


Fig. 3—Schematic wiring diagram showing ground control and grounds for 60/10 or 2.2-kv. substation.

after the flashover the machine again was placed back on the line. A very slight damage was done to the insulators and later, when operating conditions permitted, the insulator that flashed over was replaced. A thing surprising to the operators in charge was to find that notwithstanding the seriousness of the flash at the point of failure, there was not a single piece of equipment damaged on the switchboard or any other place.

The lead to the ground well in Fig. 2 need not be any larger than as dictated by the high-tension conductor.

Figure 3 shows diagram which is typical of 60-kv. to 15- or 10-kv. racks. The solid line shows the net work, the dotted the main circuits. No. 2 represents the ground well, which usually is made up of plates inserted in permanent moisture. The solid line connects the 60-kv. net work to the case and usually is made up of two No. 4/0. Two conductors are preferable to insure a connection from the 60-kv. net work to the transformer in case one should become severed. The conductor that ties the 15-kv. net work to the case usually is of lager

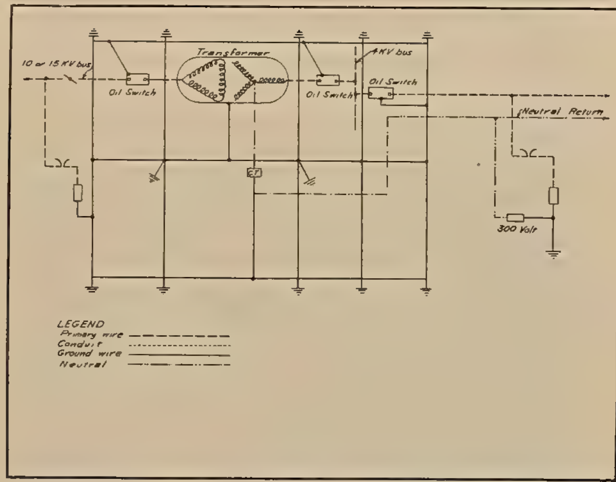


Fig. 4—Schematic wiring diagram or ground current control and grounds where transformer case and operating mechanisms of all oil circuit breakers are connected to grounding system.

conductivity than the one leading from the 60-kv. It may be two No. 4/0 or larger, depending upon the carrying capacity of the main transformer secondary leads. The grounds shown on No. 1 and No. 3 are pipe grounds for lightning arresters.

Figure 4 shows the typical layout used for 10- or 15-kv. to 4-kv. substations. This consists of a net work with pipes driven at various points throughout the net work and the 4-kv. neutral return tied to the transformer neutral. The lightning arresters on the 4-kv. usually are placed at the first pole. Three 4-kv. lightning arresters are directly tied to grounded pipes driven into the earth at the foot of the pole. In addition to this, a 300-volt arrester is tied to the neutral return. The lightning arrester on the 10 or 15 kv. is located at the station and therefore is tied directly to the net work. In addition to the grounds at the station, the neutral return is grounded with pipes driven at various points along the line.

This in a brief way outlines recent practice. Since the adoption of this system of grounding there has been not a single indication of dangerous conditions about the substations and power house premises. Therefore it is believed that the fundamentals as outlined are very nearly correct.

Station Grounds on the San Joaquin System

By H. N. KALB

ON all power systems using a Y connection on transformer banks the quality of the ground connection is an important feature. Even with delta banks the ground connection is an important feature if a ground detecting device is used. Just how good this ground connection may be often is a much debated question and if trouble arises the usual recourse is to add ground connections until it is believed that again it is safe for all conditions. The types of grounds used are many and consist of everything from a single galvanized-iron pipe driven into the earth and connected to the grounding lead by means of solder or a copper ground clamp, to an elaborate net work of driven pipes connected together with a net work of copper wires covered with charcoal and other porous material and provided with water pipes to keep the surrounding earth moist.

Solder is a good agent for making connections provided a good firm mechanical connection first is made

and a good job of soldering is done so that the metal surface are well tinned over an area sufficient to prevent fluxing of the solder when a heavy ground current is experienced. Soldering a wire to the inside of a pipe is the poorest kind of a connection and should not be used under any circumstances as the solder may be melted entirely away from the wire and pipe at a time of an abnormally large ground current and the ground connection entirely lost without any knowledge of what has happened.

Various methods of measuring the ground resistance have been tried with varying success. One of the methods used is the so-called three-point method. This consists of the main ground to be tested and two temporary grounds, the three forming as nearly as possible

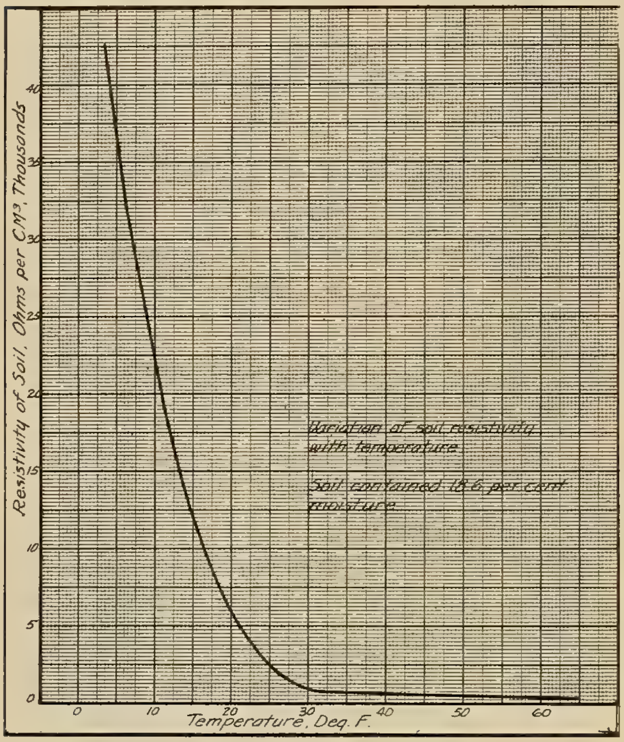


Fig. 1—Variation of soil resistivity with temperature. Soil contained 18.6 per cent moisture.

an equilateral triangle. Current then is passed through two grounds at a time and the current readings and the voltage drop taken. From these values the resistance in each of the three sides of the triangle is figured.

However, in most stations all the grounds and neutrals are tied together and it is the total result that is interesting and not the contact resistance of one individual ground. The ground return resistance, in the case of Y-connected banks with the neutral grounded, consists of the earth return between stations in parallel with the resistance of the transmission line wires which are in series with the high voltage windings of the station transformer. In measuring this resistance with direct current the impedance of the transformer windings are neglected. If the d.c. measurements are to be used, the resistance can best be measured by the use of a portable bridge with a 2-m.f., 1,000-volt a.c. condenser connected across the terminals of the bridge. Where there is a telephone line between the two stations, the telephone line can be shorted and grounded at one end and the bridge with condenser placed between line and ground at the other end and the resistance measured directly. For safety it is well to insert a choke coil between the telephone line and the portable bridge. A good choke coil is the highly insulated winding of a telpehone insulating transformer with the other winding open. These transformers have a low-resistance but high-impedance winding, making ideal protection. The characteristics of the station transformer always are on record and if a closer check is desired the impedance of the winding can easily be figured for each case. If only a general condition of the station grounds is desired, the d.c. bridge measurements are adequate.

A number of tests have been made with both the

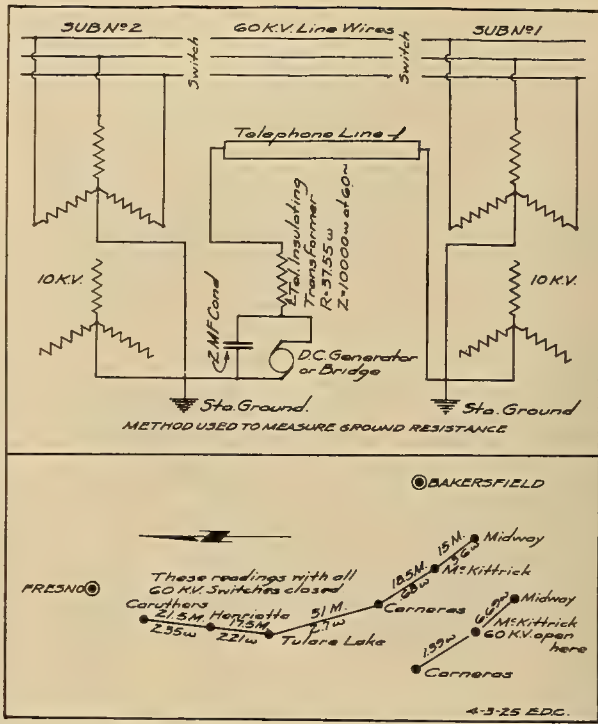


Fig. 2—Schematic diagram showing location of and method of making ground-resistance measurements.

portable bridge and a small motor-generator set and they check very closely. These tests have been made mostly between substations and with the following results: (See Fig. 2.)

Miles between substations	Ohms in ground return
21.5	2.35
17.5	2.21
31.0	2.70
18.5	.68
15.0	3.60

These results indicate that these stations are provided with adequate grounds, provided that the contact area is sufficient to prevent a burning of the earth that is in contact with the metal ground. If sufficient heat is generated at the contact between the metal and the earth, fusion results and an insulating substance somewhat similar to glass often is formed. This may not occur with a ground, but the earth next to the metal may be sufficiently dried out and parched so that it forms a very

Fig. 3—Variation of electrical resistance with various sizes of standard pipe. Pipes driven to depth of 10 ft. in fairly wet soil.

high resistance. This would indicate that grounds should be designed for contact area just as switches are designed and with the same thought in mind.

In an article by H. M. Towne, of the General Electric Company, published in the Electrical World of Jan. 26,

1924, a statement is made that the capacity of a good average ground pipe driven 10 ft. into moist, moderately salted soil is from 5 kw. to 20 kw. This is for a ¾-in. pipe. For larger pipes the capacity should increase in proportion to the increase in the contact surface of a larger pipe. It is believed that most companies use pipes larger than ¾ in. for station grounds because of the greater contacting area and consequent mitigation of the danger of drying out the earth enough seriously to affect the ground resistance. The curves shown in Figs. 3, 4, 5 and 6 also were taken from Mr. Towne's paper and show very clearly the effect on ground pipes under various conditions of moisture, temperature, size and depth. From these curves it seems logical to conclude that with a moisture content of 20 per cent a ground temperature of 32 deg. F. or higher, and the pipe driven to a depth of 10 ft. or more a first class ground will be provided which does not vary to a great extent with the size of the pipe. The size of the pipe will determine the contact surface and the capacity in amperes that may be obtained without the earth drying out at the point of contact with the pipe.

In making tests for ground conditions along the south and west sides of the San Joaquin Valley, use was made of a 4-ft., ⅝-in. ground rod with a long tapering point and also one with a blunt end. These tests were made during the last of July, 1924, when the soil was extremely dry. The soil was light silt with a very small quantity of fine sand and a trace of alkali. Whenever the tapered rod was driven a ground was obtained at once but if it was turned slightly the contact was broken completely and a slight tap of the hammer was necessary to restore the contact. Anything to cause pressure of the earth against the ground rod was all that was needed. It was very difficult to get a good contact with the blunt ground rod.

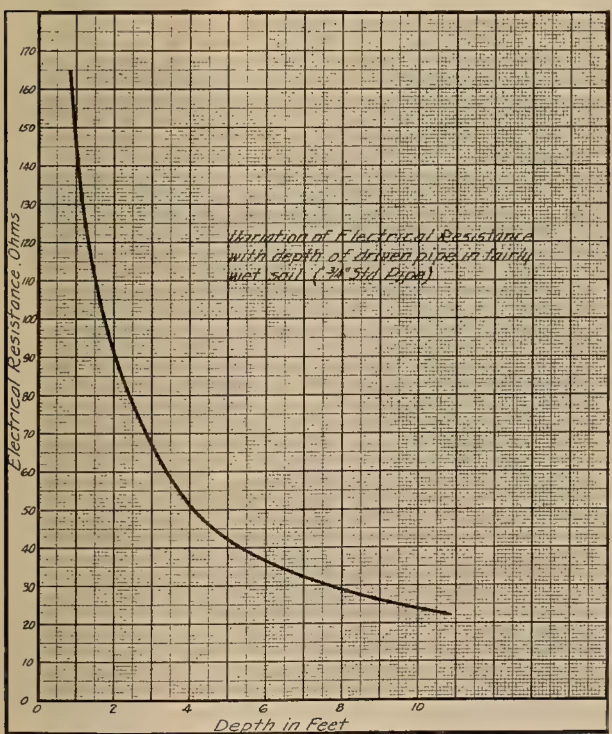


Fig. 4—Variation of electrical resistance with depth of driven pipe in fairly wet soil (¾-in. standard pipe).

In the Nov. 28, 1924, report of the apparatus committee an appendix gives the report on a very interesting test of ground resistance with per cent of total voltage drop at the tested ground, showing that 82 per cent of the drop occurred within a distance of 1 ft. of the ground pipe. These tests were made with 6-ft. ground pipes, but the intermediate readings were taken on rods only 1 ft. in length. If anyone has made a similar test, but with the use of 6-ft. rods for the intermediate readings, a comparison of results would be interesting.

In conclusion, good station grounds should be designed for the necessary carrying capacity as might be determined by a set-up on a system calculating board. Provision should be made to keep the moisture content of the soil above 20 per cent and the ground pipes should be placed to a depth of 10 ft. or more. If multiple grounds are used, they should all be provided with means of keeping the moisture content above 20

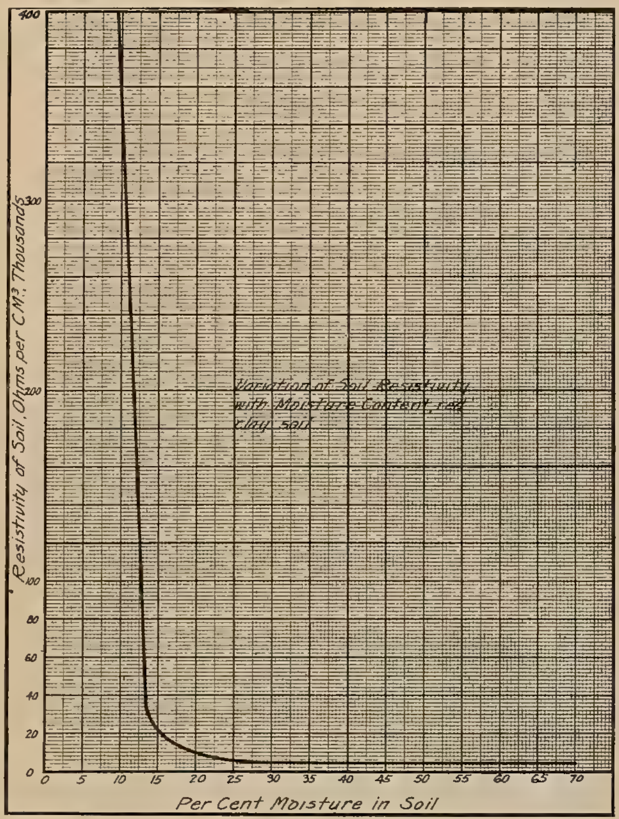


Fig. 5—Variation of soil resistivity with moisture content (red clay soil).

per cent. The use of salt around the ground pipes always is advisable and if the pipes are well galvanized, corrosion should not give a great amount of trouble. This would be taken care of through the yearly tests as recommended in the report of this committee of Nov. 28, 1924.

Stations Grounds on Pacific Gas and Electric Company System

By B. D. DEXTER, H. S. LANE and H. T. SUTCLIFFE

IN general it is the practice of the Pacific Gas and Electric Company in the construction of new stations to provide separate grounds for the various classes of duty, such as the grounding of power transformers, switch and bus frameworks, building frames, switchboards and instruments, segregating these into currrent-carrying grounds and static grounds. To current-carrying grounds are connected power transformer neutrals, both primary and secondary, neutrals of the high-tension sides of current and potential transformers, generator neutrals and other such points. To static grounds ordinarily are connected switch and bus frameworks and similar structures, building frames, neutrals of current and potential transformer secondaries, switchboards and conduits, neutrals of 110/220-volt transformer secondaries and instruments cases.

The above classification is general only and is not strictly adhered to in all cases. In some cases, one of which will be described later, where ground conditions particularly are favorable and a high-safety factor assured, all connections are made to the same ground. In other cases where ground conditions particularly are unfavorable, the apparatus connected to the static ground may be still further segregated so that the switchboard and building frame together with apparatus attached thereto may be grounded to a ground

separate from everything else. Where lightning arresters are installed they usually are grounded separately. No rigid standard of grounding has been adopted as it has been found necessary to make practice flexible enough to permit adoption to conditions met with in individual installations.

Regarding the size of conductor used, in no case is a conductor smaller than No. 4/0 allowed for the current-carrying ground and in general a conductor is used

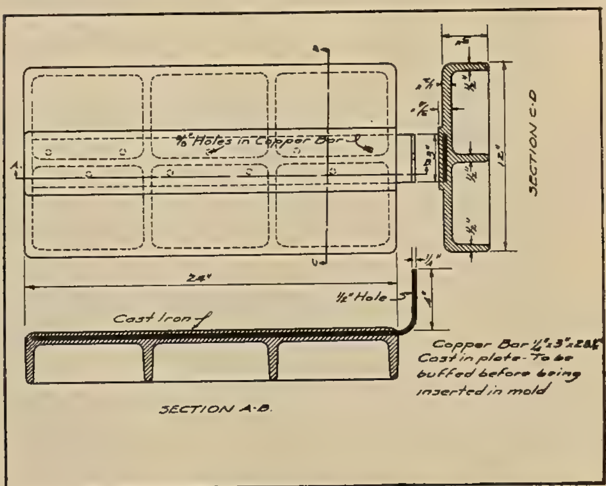


Fig. 1—Cast iron ground plate.

which is sufficiently large to carry the maximum ground current possible under any conditions. The size of the conductor to the ground contact surface or in other words the ground plate, is figured with the same idea in mind.

The standard ground plate as shown in Fig. 1 generally is used although in special cases well casings or other forms of ground plates may be utilized.

Representative grounding systems of recent construction are shown in Figs. 2, 3 and 4. These are particularly with reference to the grounding systems installed by this company.

Claremont Substation

There are at Claremont substation, constructed in 1922, a bank of three 10,000-kva. transformers and a bank of three 667-kva. transformers stepping from 110 to 60 and 11 kv. There are on the high-tension side of these banks two 110-kv. oil switches used for bank protection and five 110-kv. oil switches for sectionalizing and switching the 110-kv. lines entering and leaving the station. On the low-tension side there are the usual 11-kv. feeder switches, switchboard and auxiliary apparatus.

The current-carrying ground at this station consists of three 500,000-circ. mil cables in multiple running to eight standard cast-iron ground plates set in the bed of the northeast arm of the East Bay Water Company's Temescal reservoir. The distance between the station and this ground is 425 ft. approximately, and the conductors are enclosed in fiber conduit for practically the entire distance. To this ground are connected the primary neutrals of the 110-kv. transformer windings, including the potential transformer primary neutrals. It also is used as a static ground for all of the yard structures, including the tanks of all of the high-tension switches. The secondaries of the 110-kv. potential transformers also are connected to this ground. In addition to the eight ground plates above mentioned, one plate is placed under one foot of each switch tower and connected into the net work as an additional precaution. The low-tension grounding system consists of 4/0 leads leading from this station a distance of approximately 550 ft. to two cast-iron ground plates set into the ground beside a spring. This ground is on the opposite side of the station from the current-carrying ground and both grounds are outside of the station property. To this ground are connected the building frame, switchboard, conduits, instrument cases, current and potential transformer secondary neutrals, 11-kv. oil switch tanks and mechanisms, disconnect switch bases, lighting transformer cases, and other similar points.

South San Francisco Substation

The layout of the grounding system at this station, constructed in 1924-25, is shown in Fig. 5. It will be noted that there are four grounding systems here employed.

(1) The 60-kv. power or current-carrying ground to which are connected the 60-kv. neutrals of the transformer banks. This ground is connected to four standard cast-iron ground plates. To this also are connected the primary neutrals of the 4-kv. potential transformers.

(2) The 4-kv. current-carrying ground to which are connected the 4-kv. transformer neutrals and which also is grounded by means of four standard cast-iron plates.

(3) The ground to which is connected the 60-kv. structures and which is a static ground connected to four plates.

(4) The static ground to which is connected the building frame, switchboard, conduits, current and po-

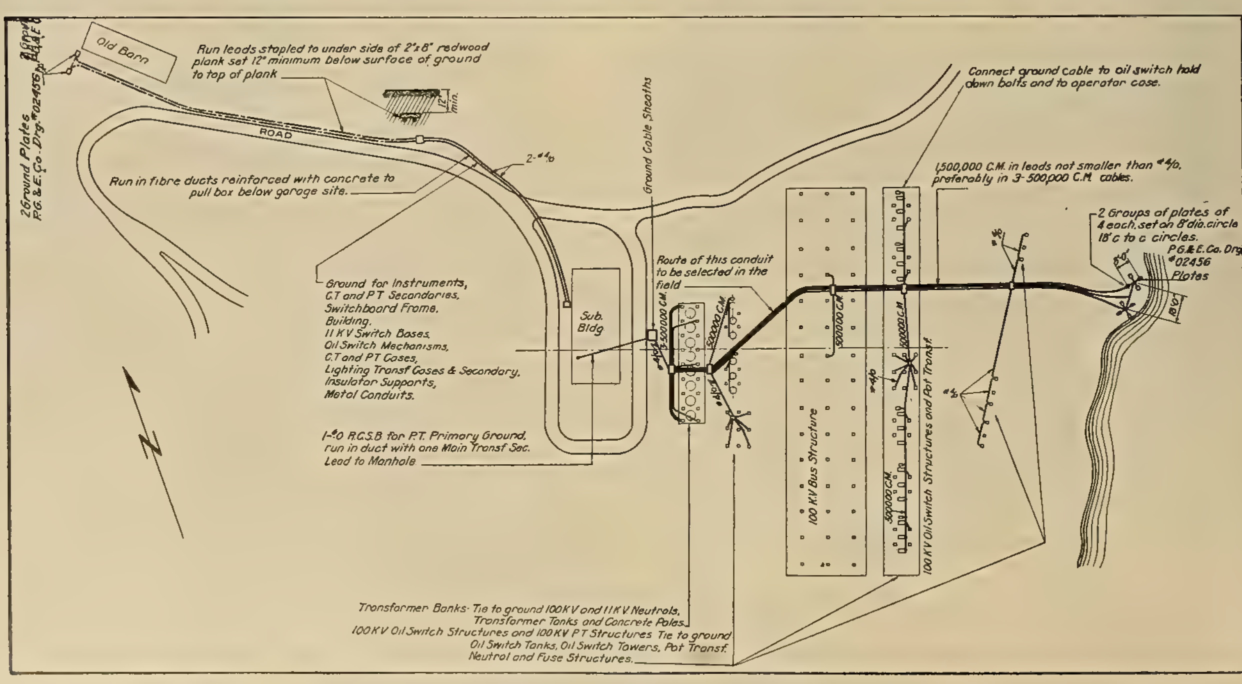


Fig. 2—Arrangement of ground cables at Claremont substation.

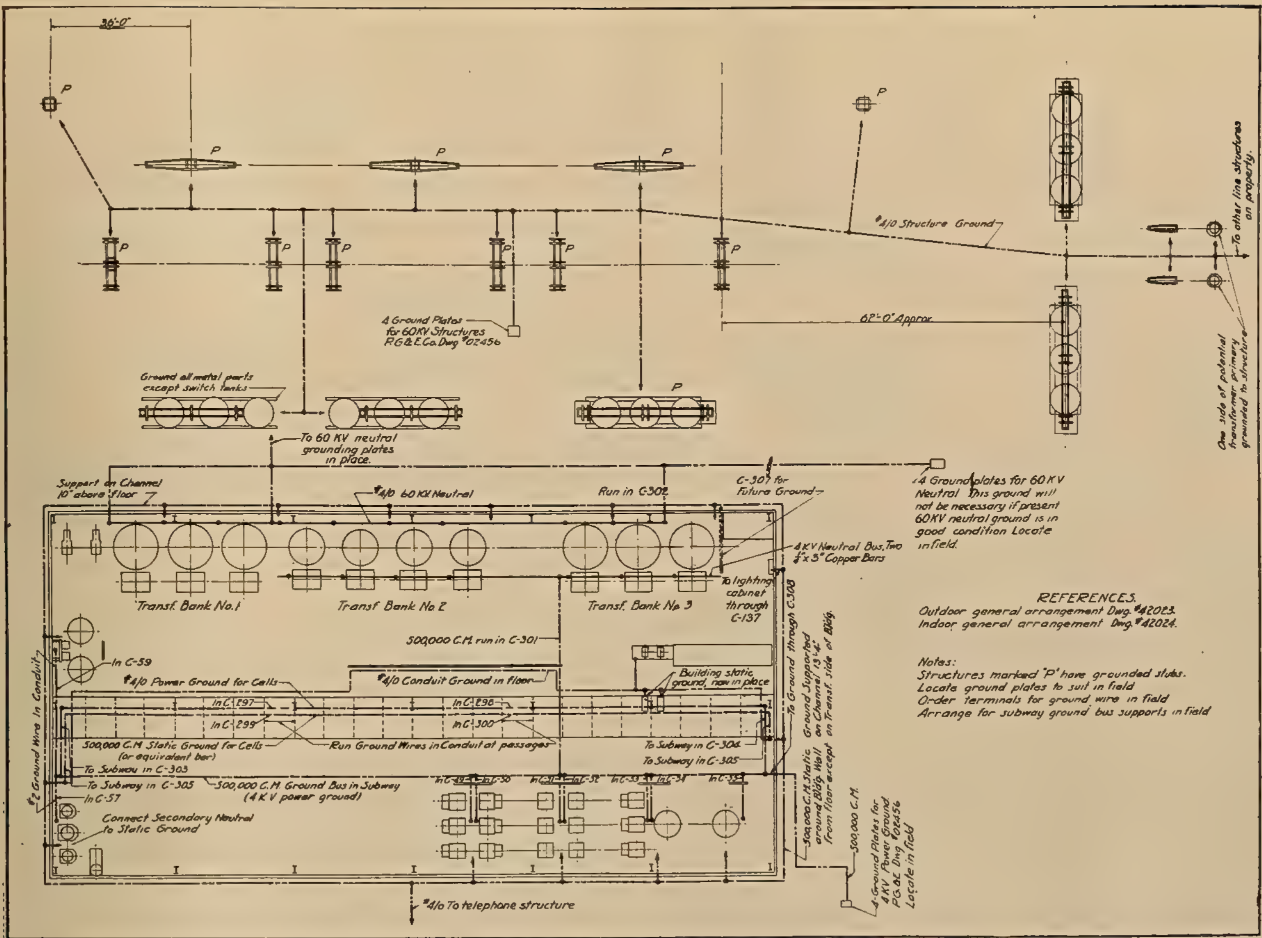


Fig. 3—Grounding system at South San Francisco substation.

tential transformer secondary neutrals, instrument cases and similar points.

The capacity of the transformers at the above station, including the three banks, is 18,000 kva. total.

Pit River Power House No. 3

Perhaps the outstanding feature of the ground system of Pit River power house No. 3, constructed in 1924-25, is the fact that a single ground loop is employed to which all individual grounds are connected. This loop passes completely around all apparatus to be grounded and terminates in two series of ground plates, each consisting of three copper plates 5 x 10 ft. and fastened together by 500,000 circ. mil bare copper cable soldered into grooves formed on the edge of the plate. These ground plates are buried approximately 2 ft. below the concrete apron in the tail race and over the center of each individual plate is a 3-in. hole to permit the passage of sufficient water to keep the ground surrounding it always moist.

From each of these series of ground plates two 500,000-circ. mil bare copper cables are laid to the apparatus to be grounded, including the tanks of oil switches and transformers, framework of the building, transformer and generator neutrals, penstocks and instrument cases.

The cable which was used was taken from the high-tension line originally connecting the Hat Creek power house. Due to the capacity of the grounds installed it was thought better to connect everything to them rather than to endeavor to secure separate grounds for the different classes of grounding service.

By installing two complete grounds, one on each end of the loop above mentioned, the chance of a ground failure is rendered almost nil.

Testing Station Grounds

This company has not made a practice of conducting periodic tests of station grounds and it is only in isolated instances that installation tests have been conducted. In October, 1921, tests were carried out to determine the resistance of the two grounds at Claremont substation and for the purpose of making these tests the net work of pipes forming the circulating water system was used as a third ground. By taking a series of readings between each combination of two grounds simultaneous equations were developed and the actual over-all ground resistances, including a certain amount of conductor resistance, were determined.

In these tests all connections were made very close to the substation building and alternating current was used. Current was obtained from the primary side of a current transformer by exciting the secondary side at 110 volts through a small carbon-pile rheostat. Values of current of from 80 to 100 amperes were obtained and the voltage drop across the two grounds was recorded. The resistance of the current-carrying ground was found to be 0.0056 ohm and the resistance of the static ground 0.0092 ohm. Although this seems unusually low, it must be remembered that at this time of the year conditions were very favorable and that both grounds are located in soil which normally is saturated.

Furthermore, there is only a comparatively short distance between the two grounds so that the readings actually are conductor-to-ground resistance (neglecting a very small amount of conductor resistance) and do not include a larger drop which might take place between the two grounds if they were more widely separated.

General

An accident which occurred due to improper grounding on Sept. 14, 1924, at the Livermore substation may be of interest. There was installed at this substation a 60-kv. lightning arrester which was connected to the same ground to which was attached the cases of the transformers in the main booster bank. This ground had been operating satisfactorily without any indication of trouble. At 12:50 p.m. on the above date, however, lightning jumped the 60-kv. horn gaps at this station and instead of finding sufficient capacity in the lightning arrester ground, jumped to the transformer cases and from there to the main neutral ground of the station transformers which was installed within a comparatively short distance of the transformers. In so

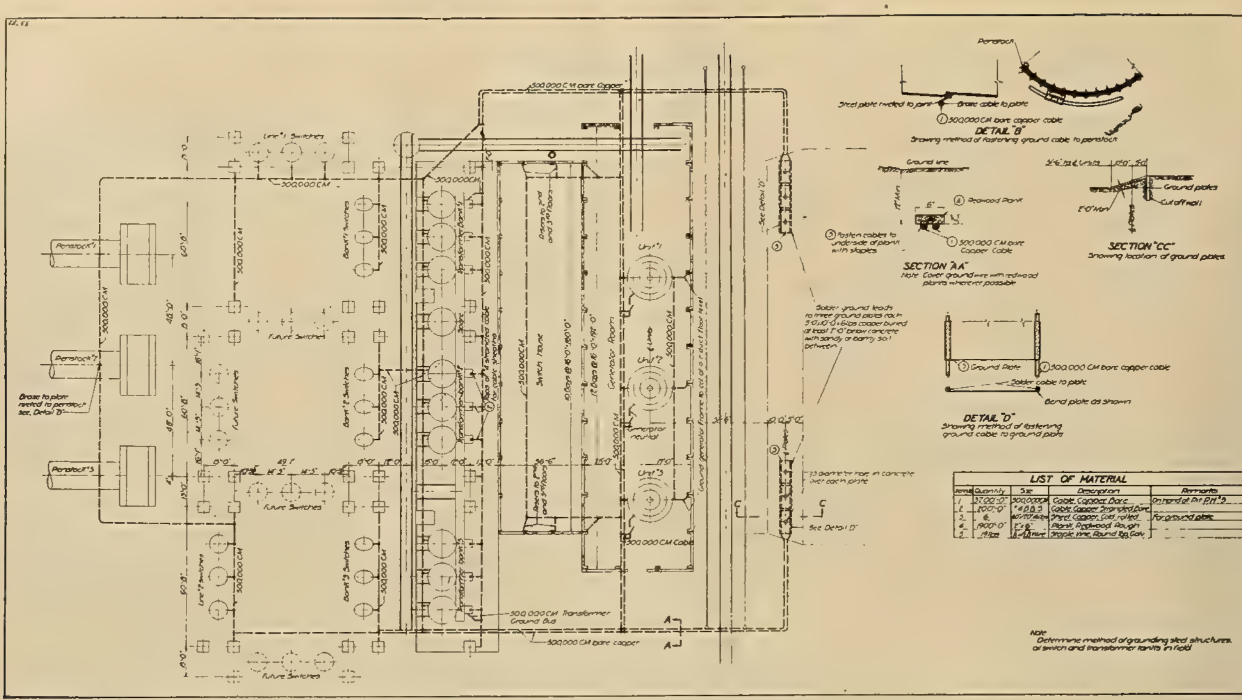


Fig. 4—Arrangement of ground plates and cables at Pit 3 power house.

doing it burned a large hole in the case of one of the transformers, necessitating taking it out of service for repairs. This difficulty could not have happened had the lightning arrester been grounded separately from all other apparatus.

At some of the outlying stations we have experienced difficulty in obtaining proper grounds at or near the station and have been obliged to locate the grounds at some distance, carrying the grounding wires either overhead or under the ground from the station to the point of final grounding. At the Long Point substation two ⅜-in. guy cables are carried 250 ft. from the station to the stream. These cables are buried in the ground and are grounded at the stream to standard cast-iron ground plates. One is used for a power ground and one for a static ground. These circuits were buried principally due to the fact that the station was not intended as a permanent station and no difficulty with rusting of the galvanized cables was expected during the comparatively short period of time it would be in operation.

At Colfax substation there are two No. 3 copper conductors carried overhead for a current-carrying ground and one No. 6 for a static ground. These are carried overhead a distance of 400 or 500 ft. to plate grounds for the power ground and a pipe which is driven for the static ground.

Fire-Fighting Equipment Used by L. A. Bureau of Power and Light

By H. H. COX

FAILURE of oil-filled apparatus on the system of the Los Angeles Bureau of Power and Light during the past year has been confined to oil switches having insufficient interrupting capacity. A rather serious interruption was caused by such a failure splitting a welded seam on an oil-switch tank, scattering oil about the station and causing rather a serious oil fire. This switch had its tank vented to the outside of the station through a 3-in. vent pipe connected to a common header across the three tanks.

The two tanks nearest the vent pipe were bulged seriously but did not rupture. Apparently the venting was insufficient to relieve the pressure in the third tank. These switches now have been rearranged to have a vent pipe from each tank.

Fire-Fighting Equipment

Fire extinguishers in the stations of this bureau all are of the carbon tetrachloride type. One-quart pump-type, 2½ gal. pump-type and 1-gal. air-pressure types are used. No Foamite equipment is as yet in use in the stations. The local fire department has two Foamite trucks in use and these trucks are rather conveniently located near the largest substations.

In case of a serious oil fire in any of the stations our load dispatcher has instructions to call the fire department and request this apparatus. Cooperation of the fire department in this matter has been assured.

Fire Caused by Failure of Oil-Filled Apparatus

By H. A. LAIDLAW

THERE has been a number of cases of oil-switch failure due to insufficient rupturing capacity of the switch. In some cases the oil has been ignited and has caused considerable damage. One outdoor transformer bank of 750 kva. capacity was completely destroyed by fire due to the oil becoming ignited from an external fire caused by the burning of a small booster transformer, burning oil from which ignited a timber foundation under the larger transformer bank. As a matter of information, this was a temporary installation. The three transformers in the main bank were destroyed completely.

With regard to the equipment for fighting oil fires, this company provides in its various stations sawdust contained in suitable containers, also Pyrene and Babcock extinguishers. Foamite has not been used on this system.

Fire-Fighting Practices of San Joaquin Light & Power Corporation

By J. M. BUSWELL

CARBON-tetrachloride fire extinguishers are used at all stations and substations of the San Joaquin Light & Power Corporation. Two types have been standardized upon:

(1) One-quart, pump-type extinguishers in which the hand pump passes air into the liquid chamber, providing a pressure which ejects the liquid through a nozzle provided with a shut-off valve. This is distinguished from any type from which the liquid is ejected from the extinguisher directly by the pump.

(2) One-gallon extinguishers provided with an interior chamber in which an air pressure of about 100 lb.

is maintained by a self-contained hand pump. On this type of extinguisher there is a gage which shows the pressure in the air chamber, which is shut off by a valve from the liquid chamber, and there is a gage glass on the liquid chamber through which the liquid level may be observed. The liquid chamber can be refilled without exhausting the air because of the fact that the air chamber is shut off from the liquid chamber when the extinguisher is idle.

While it is a fact that carbon tetrachloride thrown onto a hot fire liberates a harmful gas there has been no experience of injury beyond slight soreness of throat in two or three cases.

It is true that the United States Bureau of Standards' specifications should be adhered to in purchasing the carbon tetrachloride for these extinguishers. Monthly inspection is necessary on the one-quart, hand-pump type that they may be kept filled.

Foamite extinguishers are used quite extensively on the system. They are standard equipment for all gasoline, fuel-oil and paint storage and handling risks, and transformer-oil storage or warehouse risks.

These extinguishers have been used upon several occasions and no failures or difficulties have occurred.

Inspection has at times shown the partly clogged condition of the hose and nozzle of a Foamite extinguisher. Realizing that with this type of extinguisher the hose may be left filled with a foam which may dry and obstruct passage the next time the extinguisher is used, a special point is made to keep ever before employees the necessity of thoroughly rinsing this type of extinguisher, including the hose, before recharging. The nozzle as well as the extinguisher in general is inspected each month. If a nozzle shows any signs of obstruction a wire is run completely through the hose and if any substance shows then the extinguisher is removed and attended to, because it is likely that since it was installed or last inspected it has been tipped or shaken.

It also has been noticed that there is on the market at least one brand of recharging material not put up by the manufacturers of the extinguisher, but by some independent concern, the material itself being inferior and causing a caking at the bottom of the extinguisher.

A small supply of this unauthorized material was obtained inadvertently and before discovered by inspection there were complaints to the effect that deterioration of the material itself took place and exploded the cans in the warehouse. Further, there were complaints to the effect that when mixed in the extinguisher and allowed to stand a while cakes formed on the bottom which are liable to break up into scale and clog the extinguisher.

For these reasons all extinguisher materials are purchased strictly on specifications. It is necessary to inspect the supplies received to make sure that they conform to these specifications.

Fire-Fighting Equipment and Experience of the Edison Company

By J. C. GAYLORD, H. L. SAMPSON and L. L. DYER

THE Southern California Edison Company has a committee of four the duty of which is to inspect stations and make recommendations as to what precautions should be taken to prevent fire and also to recommend what fire-fighting equipment should be installed in stations.

This committee has made a great many specific recommendations in regard to stations which existed when the committee began its work and has made general recommendations which, for new work, are being followed now.

(1) For 750 to 3,000-kva., 11/4-2.2-kv. distribution station, without operators:

1 Standard box.
1 Phister extinguisher—1 gal.
1 Phomene extinguisher—2½ gal.
1 Pyrene extinguisher—1 qt.

(This type station consists of an outdoor steel rack for a single 11-kv. line with arresters, a bank of three 250-kva. to three 1,000-kva. outdoor, natural cooled transformers and simple connections, and a 16 x 24-ft. sheet steel building with equipment inside for a maximum of six 2.2-kv. or 4-kv. lines arranged for connection to one or two three-phase induction regulators.)

(2) For 1,500 to 6,000-kva., 11-15/4-2.2-kv. distribution station, with operators:

1 Phister extinguisher—1. gal.
1 Phomene extinguisher—2½ gal.
1 Pyrene extinguisher—1 qt.

(This type of station is similar to the one of smaller capacity noted above except that there are three or four outdoor 11- or 15-kv. switches and each distribution line has its own regulator, so there may be from three to ten regulators.)

(3) For 3,000 to 15,000-kva., 60/15-kv. or 11/4-2.2-kv. transmission and distribution stations, with operators:

1 Oceco engine, 10 gal. capacity.
1 Phister extinguisher—1 gal.
1 Phomene extinguisher—1½ gal.
2 Pyrene extinguishers—1 qt.

(This type of station consists of 60-kv. outdoor steel rack with three or more circuits, a 15-kv. or 11-kv., outdoor steel rack with three or more circuits, and some 4-kv. or 2.2-kv. equipment with three or more circuits.)

Synchronous Condensers and Generators

Condensers of 5,000-kva. capacity or below are not equipped with special arrangements for fighting fire unless they are of the type having closed end-bells and exhaust ducts for the hot air. In such cases means are provided for closing the exhaust ducts and connecting a portable Oceco engine to smother the fire inside the closed system.

Condensers of 10,000-kva. capacity and larger are provided with exhaust-air ducts having dampers for closing the ducts. A 10-gal. Oceco engine is permanently connected through the condenser housing to a pipe ring with non-automatic spray nozzles at each end of the stator winding. A valve is conveniently located outside the condenser housing so that in case of fire the carbon tetrachloride can be turned on by the operator.

Many of the larger generators in the steam and waterpower plants are equipped in a similar manner to that just described for the larger condensers. Some of the steam-driven generators are equipped with live-steam smother systems. In the new steam plant at Long Beach the cooling system for the generators is closed completely and the same air is used over and over again. These generators are equipped so that carbon tetrachloride can be injected into this air in quantities sufficient to insure an atmosphere which will not support combustion.

The high-tension switches in this plant are enclosed each in a separate compartment with fire doors between compartments. These compartments are piped to a central point where a supply of carbon tetrachloride is kept under pressure and so connected with a system of pipes and valves that the operator can turn the liquid into any compartment where a fire exists. Each compartment is equipped with non-automatic spray nozzles to finely vaporize the liquid and direct it at the switch in that compartment.

Cottages, store rooms and other similar buildings are provided with the standard soda-and-acid extinguishers.

Fire-Fighting Experience

There are the following experiences to report in regard to fighting fires in stations:

(1) On March 18, 1923, Newmark station was wrecked by an explosion and resulting fire. It consisted of one large room with ten 60-kv. Kelman indoor breakers, three 15-kv. Kelman indoor breakers and six 1,500-kva. transformers.

The explosion apparently was caused by a breaker failure and was of such violence that it tore the heavy doors from the building and hurled them nearly a hundred feet. The fire which followed was so intense that no attempt was made for some time to extinguish it. It was finally extinguished by about one hour's work with a ¾-in. garden hose.

(2) On Sept. 5, and again on Sept. 18, 1923, 15-kv. breaker failures in Vernon substation filled the bus room with burning oil and developed such severe fires that the whole bus fell from the ceiling. The first fire was extinguished in 15 minutes and the second in 10 minutes with 10 gal. of carbon tetrachloride and 20 gal. of soda-and-acid chemical.

(3) On Feb. 2, 1924, a 30-kv. breaker exploded at Los Angeles substation No. 3, an outdoor station. An oil fire of great violence developed. The use of tetrachloride had practically no effect, but the fire depart-

ment extinguished it within five minutes after its arrival with water.

(4) March 3, 1924, a fire from the failure of a K-12 breaker in Dalton substation was very quickly extinguished with a 2½-gal. Phomene extinguisher, but the station was off the line for 8 hours to clean up and dry out the equipment.

(5) On July 15, 1924, a violent explosion and fire occurred in a 15-kv. switch gallery of the Redondo steam plant. Because of its location, water could not be used. All available chemicals had no effect because it was impossible to get near enough to reach the seat of the fire. It was finally extinguished by a Foamite pumping engine furnished by the Los Angeles fire department. Here also was a very extensive clean-up job after the fire was extinguished.

Conclusions

The following points are the conclusions arrived at in regard to the different methods of extinguishing station fires:

(1) Water is the most effective extinguisher when applied in sufficient quantities, but will do considerable damage itself and make drying out necessary if used on equipment. (2) Foam is very effective, but also leaves equipment in bad shape. (3) Tetrachloride is effective in confined places but is of little use in the open unless used by an experienced person. In any case, tetrachloride gas is dangerous to life, and all station men should be well instructed in its use. (4) Sand or a mixture of Redwood saw-dust and soda can be used very effectively on small oil fires on the floor or ground, but are of little use otherwise.

The experiences previously outlined have led to the adoption of the following practices:

(1) Install all possible equipment out of doors where explosions have a minimum effect and fire can be reached from all sides.

(2) Eliminate all inflammable platforms, walks and other structures which can catch burning oil.

(3) Furnish enough water, and foam equipment to extinguish oil fires on the ground and tetrachloride equipment to smother fires in the switches themselves or in closed compartments.

(4) Foam equipment is used in 2½-, 10-, 20- and 40-gal. sizes. Tetrachloride equipment is used in ¼-, 1-, 10- and 20-gal. sizes.

(5) Cottages, store rooms and similar structures also are provided with the standard soda-and-acid extinguishers.

This report covers in brief the general practice of the Southern California Edison Company in regard to fire-fighting equipment, but does not describe any station in detail. The location of a station and whether or not city fire apparatus is available has a great deal to do with the equipment installed, especially in stations large enough that fire-fighting is given special consideration.

Fire-Fighting Apparatus at Long Beach Steam Plant No. 2

THERE are three forms of fire-fighting systems installed in the Long Beach No. 2 steam plant, none of which are automatic in their application. In the first place a fire-fighting water system has been installed all over the plant with the exception of the switch-house, this being omitted to prevent the use of a conducting liquid on parts which may be alive.

This system uses ocean water, it being the most reliable and easily available supply, taking it from the condenser intake tunnels by means of a pump at one end of the turbine room basement. Eight-inch fire lines lead from this point around the outside of the main building and connect to four risers at symmetrical points, at the ends of the building, leading to hose stations at convenient points on the different floors of the turbine and boiler rooms.

A special steam smother system has been installed to extinguish fires in the fuel oil pump room in the northwest corner of the station and in the fuel oil tanks adjacent, underground outside of the house. Two separate steam lines supply this room, steam being used also to heat the oil and to run the turbine-driven pumps. A 2½-in. line having small holes drilled along its length is placed all around the wall of the room so it can be filled quickly with steam. Pipes also lead to the hot-oil supply tanks and to each compartment of the main tanks. The valves for all of these are located in the hallway just outside the pump room.

For combating electrical fires both the generators and the switch house have been provided with carbon-

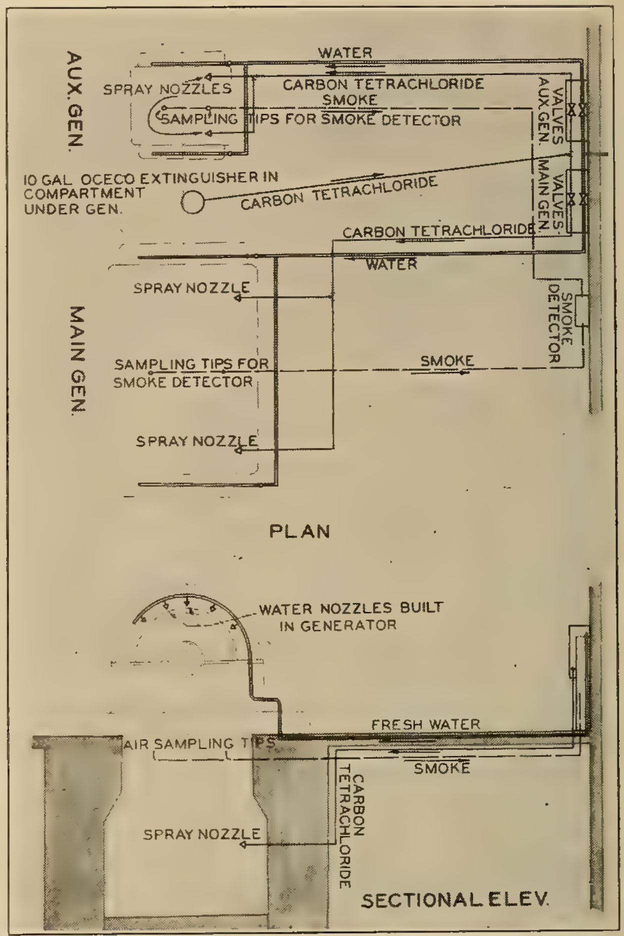


Fig. 1—Plan view and sectional elevation showing schematically the built-in fire fighting system on turbo-generator sets.

tetrachloride extinguishers, there being no other form in the switch house. The generators also have water extinguishers to use in case the others fail.

On the turbine floor near each machine are mounted three boxes, a valve box for the main generator, one for the auxiliary generator and a smoke detector for both. The latter simply is a steel box with tubes leading from the air discharge of each generator. Some of the air is blown into the box and by means of a light any smoke may be seen. This is necessitated by the fact that the generator is entirely enclosed, circulating its cooling air through a chamber containing water-cooled radiators. The air cooling chamber is directly below the generator taking a position similar to the condenser under the turbine. In this chamber the carbon-tetrachloride nozzles are directed into the stream of air entering the generators. As only a small amount of air is in the circulating system it should require only a small amount of extinguisher to smother a fire. Should the extinguisher fail to work, water may be turned on. To reduce the damage to generator this is fresh, not salt water.

In the switch house, carbon-tetrachloride is piped from tanks to each switch cell with valves in the hallway so the liquid may be turned into any cell through a single nozzle near the top of the circuit-breaker tanks. The cells are separate, concrete rooms with metal doors and oil curbs, so any fire can quickly be smothered. The main transformers and the lightning arresters are mounted outdoors and the only other indoor apparatus that may cause a fire are the instrument transformers. These are in cells, but are not provided with extinguishing pipes as the hazard is considered insufficient

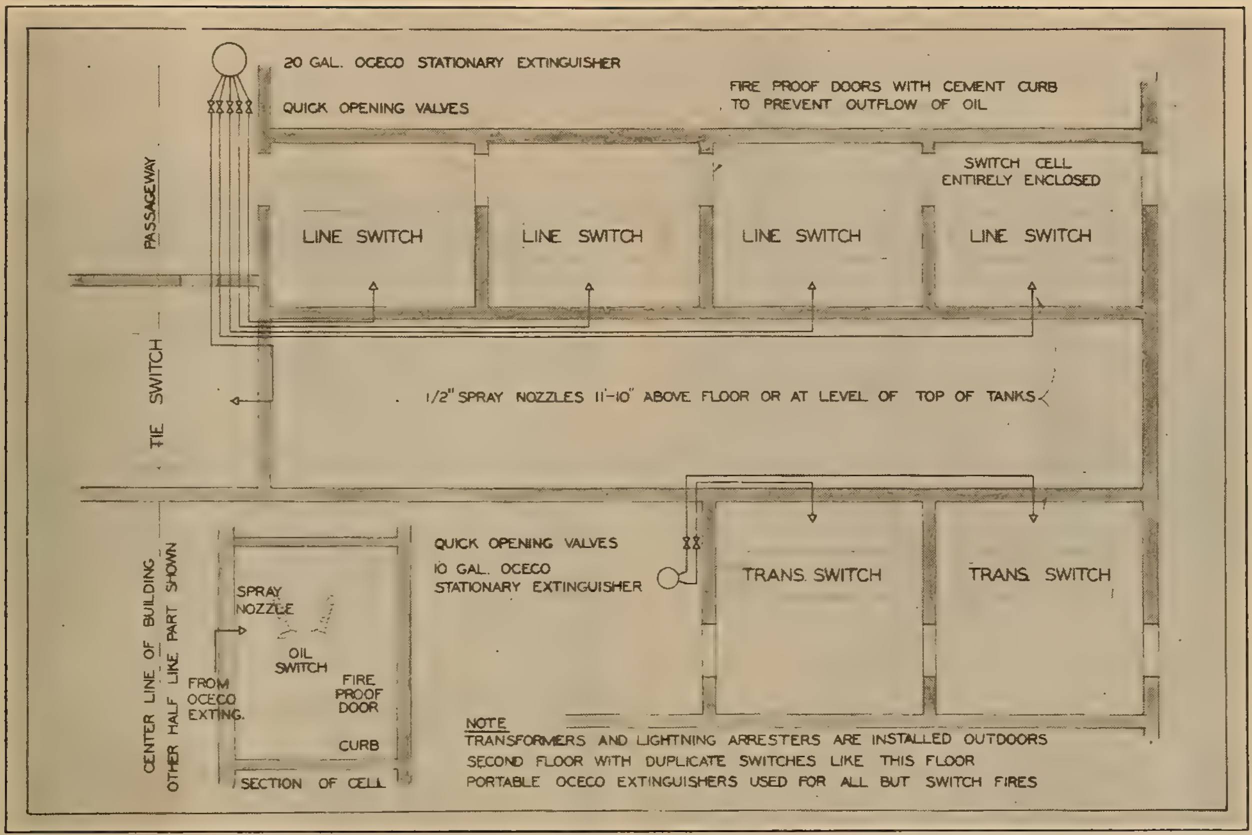


Fig. 2.—Diagram showing schematically the arrangement of the built-in fire fighting equipment installed in the new switch house.

to warrant the expense. Portable extinguishers are provided for use here or in the store rooms or switchboard room. A ventilating system is installed in the switch house with ducts to each room and switch cell so any gases generated in a switch will be carried out of the building.

Figures 1 and 2 show diagrammatically the arrangements explained in the foregoing.

Latest Development in Pacific Coast Steam Plant Practice

Report of Prime Movers Bureau, Technical Section*

THE activities of the Prime Movers Bureau for the year 1924-25 have consisted of making studies of mechanical oil burning furnaces and refractories, steam power plant layouts and heat balance. Considerable time has been devoted to round table discussion of various operating troubles on such subjects as condensers and boilers.

Mechanical Oil Burning Furnaces

Practically all the recent developments in mechanical oil burning furnaces on the Pacific Coast have been described in the last report of the subcommittee on the "Burning of Liquid and Gaseous Fuels" of the National Electric Light Association, Serial Report No. 24-86. This subject was assigned to this bureau by the national committee and what additional data was accumulated has been sent to them for their disposal.

The Southern California Edison Company in carrying on its investigation to determine the qualities of the refractories to be used in its new Long Beach steam plant station conducted extensive tests, a modified report of which is included in this report.

Steam Power Plant Layout

A detailed report on the mechanical equipment of the new Long Beach steam plant No. 2 of the Southern California Edison Company is given herewith. This report gives a very good example of the latest equipment for a high-pressure oil-burning steam electric generating plant. The data given for the Los Angeles Gas & Electric Corporation Alameda Street plant shows the equipment installed for one of the latest of the lower pressure oil burning steam electric generating plants on the Pacific Coast.

There are included in the last part of this report a heat balance calculation and diagram for the Long Beach steam plant No. 2 and also curves showing some actual test results.

Fire Brick Tests Long Beach Steam Plant No. 2

After an extensive series of tests of various makes of fire brick at the Massachusetts Institute of Tech-

* C. E. Steinbeck, Pacific Gas and Electric Company, chairman; C. F. Braun, C. F. Braun Company; J. M. Brennan, Pacific Gas and Electric Company; E. L. Champion, Pasadena Light and Power Department; C. H. Delany, Pacific Gas and Electric Company; V. Estcourt, Pacific Gas and Electric Company; G. W. Hamilton, Westinghouse Electric & Manufacturing Company; V. E. Johnson, The Southern Sierras Power Company; L. J. Kraps, Southern California Edison Company; R. F. Leefield, Los Angeles Gas & Electric Corporation; H. S. Markey, Great Western Power Company; A. Y. Meudell, San Joaquin Light & Power Corporation; R. F. Monges, General Electric Company; M. E. Mulkey, Pacific Gas and Electric Company; A. D. Murphy, San Diego Consolidated Gas & Electric Company; G. Z. Ogden, San Joaquin Light & Power Corporation; R. C. Powell, Pacific Gas and Electric Company; E. A. Quinn, San Joaquin Light & Power Corporation; Weller Reed, Los Angeles Gas & Electric Corporation; C. P. Rhine, San Joaquin Light & Power Corporation; P. M. Robinson, Hunt-Mirk Company; J. G. Rollo, Los Angeles Gas & Electric Corporation; Emory Sherwin, San Diego Consolidated Gas & Electric Corporation; C. R. Stewart, Southern California Edison Company; W. E. Thomson, Southern California Edison Company; W. E. Thompson, Southern California Edison Company; E. E. Valk, General Electric Company; R. A. Wallingford, San Joaquin Light & Power Corporation; W. J. Wheeler, San Diego Consolidated Gas & Electric Corporation; C. W. Wiggins, San Diego Consolidated Gas & Electric Corporation; F. V. Wright, The Southern Sierras Power Company.

nology under their direction, the engineers of Stone & Webster, Inc., recommended initially that fire brick hereafter designated as No. 1 and No. 2 be purchased for use in all furnaces of the Long Beach steam plant No. 2; brand No. 2 to be used in the higher temperature parts of the furnace with the exception of the floors for which brand No. 3 was recommended. A later recommendation included brand No. 1 for two furnaces complete.

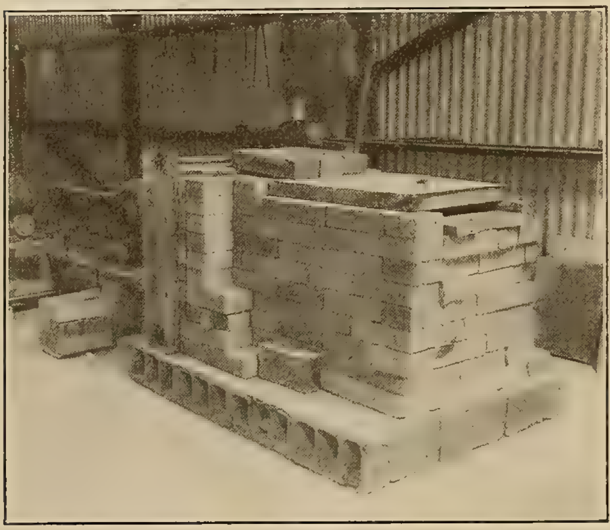


Fig. 1—General arrangement of furnace for spall test.

Due to the fact that the Southern California Edison Company was not acquainted with two of the brands and that one of them had not been tried out in mechanical fuel oil burning furnaces, company engineers felt that it would be advisable to get a comparison in as short a time as possible between these two brands and brand No. 1. To get this comparison in a short time, it was decided to place brick of each of the three brands and later a brand No. 4 in test furnaces. Various photographs and data which follow show the results of these tests.

Spall Test

Fig. 1 shows the general arrangement of the furnace used for the spall test. Fig. 2 shows the brick as set up in the furnace before firing. Gas and air were forced into the furnace by the blower and burned directly in front of the row of test brick.

At the start with the furnace closed as shown in Fig. 1 the furnace was fired for 20 min., then the gas cut off and the blower allowed to run for 10 min. with one of the top brick of the furnace standing vertically to allow obesrvation of the cooling action on the test brick. During the 20-min. heating period, the brick came up to a bright cherry red temperature estimated at between 2,500 and 2,700 deg. F., and during the cooling period they cooled to considerably below black temperature. Reading from left to right as shown in Fig. 2 the order of the test bricks is as follows: 4, 1, 2 and 3.

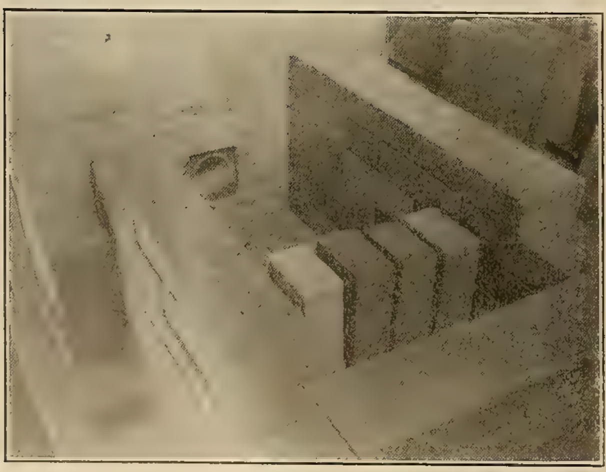


Fig. 2—Bricks as set up in the furnace before firing.

During the first cycle and within 60 sec. after the fire was started brick No. 4 began spalling and before the end of that cycle the side of the brick next to the fire showed a large number of surface cracks.

After eight cycles of 20 min. heating and 10 min. cooling each, the time of heating was changed to 30 min. with cooling for 15 min. and this cycle continued through to the 76th cycle, after which the furnace was opened and the photograph reproduced in Fig. 3 was taken. At that time brick No. 4 was considered to be of inferior quality but no difference could be found in the other three. It was then decided to try a more severe heating cycle.

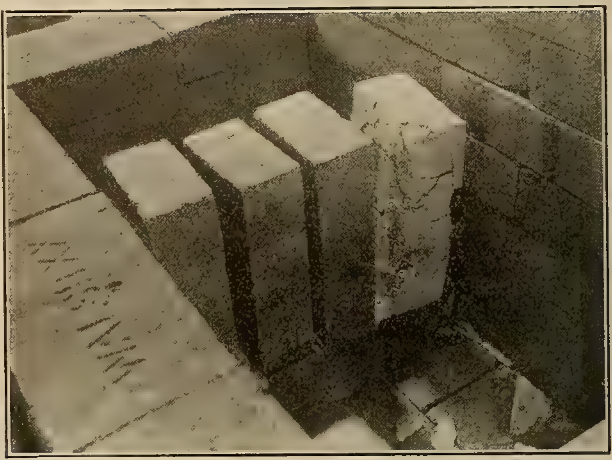


Fig. 3—Condition of bricks after 76th cycle. (Bricks are reversed in order from positions in Fig. 2.)

The 77th cycle included heating for 3 hr. until cone No. 26 was flat (3,002 deg. F.) followed by cooling over night. Fig. 4 shows the results. The samples were removed and photographed as shown in Figs. 5 and 6. Reading from left to right are samples 3, 2 and 1.

Break Test

Each test brick was then given what was called a "break test" consisting of supporting the brick with the brand side up (9 x 4½ in. face) on a 7 in. span, thus breaking it by dropping a 4½-lb. weight on it near the

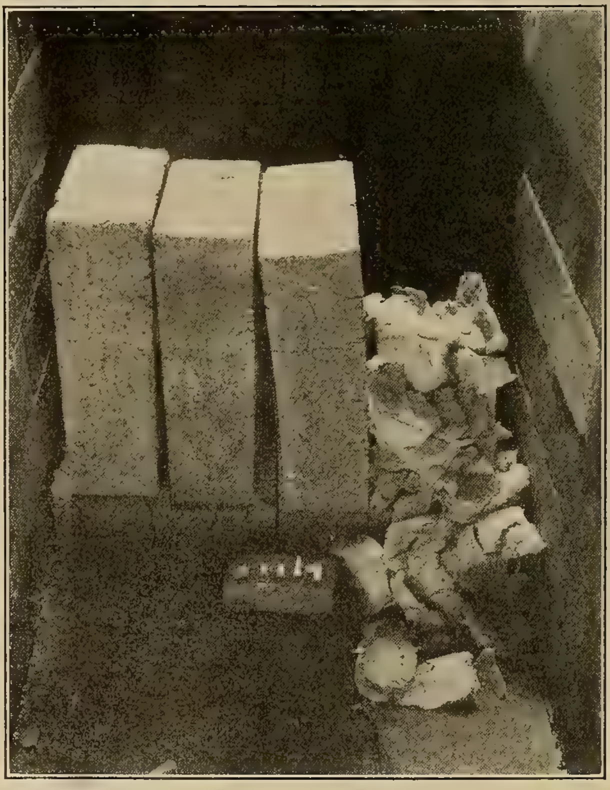


Fig. 4—Showing results after 77th cycle. (Order same as Fig. 3.)

center of the span. For the first blow the weight was dropped 1 in., for the second 2 in., for the third 3 in., etc., until the twentieth blow which was 20 in., the twenty-first 22 in., then the twenty-second 24 in., etc. The weight consisted of a piece of 1 in. round iron bar with a striking surface of approximately ½ sq. in. area slightly rounded. The weight was supported by means of a cord tied to the upper end. It was centered over the brick at the proper height by means of a guide then dropped by releasing the cord or simply quickly lowering the supporting hand. In this manner

Fig. 5—Face view of bricks 3, 2 and 1 after spall tests.

it was possible to keep the blows within an area of approximately 1½ sq. in. near the center of the span of the brick. The results of the break test are given in Table I and the broken ends of the brick are shown in Fig. 7. From left to right are samples 1, 2 and 3.

Warp Test

One brick of each of the four brands was set up with a 7-in. span as shown in Fig. 8 in a gas fired furnace. This furnace was fired for approximately 48 hr. until cone No. 28 went down and it was estimated that had

Fig. 6—Side view of bricks after tests. (Same order as Fig. 6.)

cone No. 30 been placed in the furnace, it would have been started, showing the temperature must have been about 3,100 deg. F. Fig. 9 shows the bricks after cooling. Fig. 10 shows the bricks after being subjected to the break test. They appear in the following order, 1, 2 and 3. The data of the "break test" shrinkage and warp are given in the tabulation and indicate apparently less vitrification and slightly more warp on the part of sample No. 1 than the others, but the results are hardly conclusive. Sample No. 4 failed by breaking and showed excessive shrinkage.

Kiln Fire Test

One brick of each brand was set up with the 4½ in. dimension vertical in a fire box of an oil fired kiln with the fire ends of the brick 39 in. from the oil burner. The brick and fire box were literally sprayed with oil for several days during the slow heating of the kiln. Firing continued for 8 days, then while the bricks were still hot the bag wall fell in on the test brick causing considerable deformation of sample No. 4, but

Fig. 7—Condition of bricks after breaking tests.

doing little harm to the other three. All are shown in Fig. 11 in regular order 1, 2, 3 and 4. After bricks 1, 2 and 3 were broken for observation of vitrification photographs reproduced in Fig. 12 were taken to show the texture of the brick. The shrinkage data is given in Table I. In this case sample No. 2 showed considerably less shrinkage than the other two but all were thoroughly vitrified.

Test in Boiler Furnaces of the Pasadena Municipal Steam Plant

One of the bricks of each of the four brands was set in the furnace of boiler No. 10, the base brick in

Fig. 8—Bricks set up for warp test.

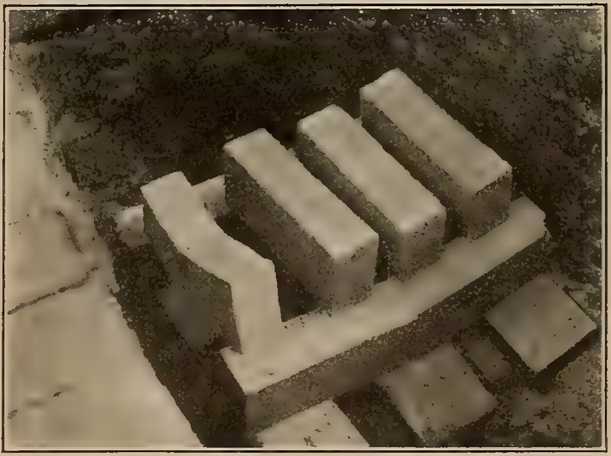


Fig. 9—Condition of bricks after cooling from warp test.

each case being the same as sample No. 1. These were set up 5½ ft. away from and a little below the level of the bottom of the air register of the mechanical oil burner. After 55 days of almost continuous firing of this furnace at 175 per cent rating, the furnace was cooled off and photographs reproduced in Fig. 13 were taken and the test bricks removed. The bricks were arranged in the following order: 4, 1, 2 and 3.

Fig. 10—Condition of bricks from Fig. 9, after being subjected to break test.

An interesting point in connection with this group of bricks was the formation of slag on the top of the bricks. This was attributed to the scale which drops from the boiler tubes on to the top surface of the bricks.

The results of the shrinkage and break tests are given in Table I. Fig. 14 shows the broken ends of these bricks placed in order 1, 2 and 3.

the bricks were removed from the furnace. Sample No. 4 bricks were found to be a mass of small pieces. About half of the top of brick No. 1 was still in place but leaning over. About one-third of sample brick No. 2 and pedestal were still in place. All of sample No. 3 had fallen over.

The bricks were removed from the furnace and measurements made as far as possible. The vitrification of

Fig. 11—Condition of bricks after kiln fire test.

samples No. 2 and 3 bricks as shown in Fig. 19 was complete. In the case of sample No. 1 the center three-fourths of the brick was not vitrified. The arrangement as designated in all other photographs, from left to right, is 1, 2 and 3. The shrinkage measurements as given in Table I indicate the shrinkage of sample No. 1 was greater than that of the others but as in other cases it seems unlikely that it should be considered conclusive.

Fig. 12—Bricks 1, 2 and 3 after kiln fire test showing vitrification.

Test in Furnace of San Diego Consolidated Gas & Electric Company

The group of bricks as shown in Fig. 15 were set up in the furnace of boiler No. 23 which is shown in Fig. 16, with the bricks directly in front of but below the second burner from the righthand side in the lower row. The bricks were considerably below the center line of

Fig. 13—Bricks after 55-day test in fire box at Pasadena steam plant.

the burner as shown in Fig. 17, the near end of the bricks being 7½ ft. from the burned wall. The arrangement of the samples as shown in Fig. 15 is 3, 2, 1 and 4.

In each case the two top bricks of the pedestal were of the brand to be tested and in the case of sample No. 4 the three top bricks. The other bricks of the pedestals were of sample No. 1. After 100 days of nearly continuous firing the furnace was cooled down and the photograph reproduced in Fig. 18 was taken before

Station Details Long Beach Steam Plant No. 2
General

Location—Long Beach, Calif., on site of plant No. 1, east end of Terminal Island.

Plot—Approximately 18 acres, El. 14, nearly level.

Service—Base load, power and light, supplementing hydroelectric system.

Capacity—70,000 kw. normal, present and ultimate, in two 35,000-kw. units.

Initial Construction—Jan. 15, 1924.

Initial operation—First unit, Dec. 3, 1924; second unit, about Feb. 15, 1925.

Buildings—Main, including both boiler and turbine rooms, and switch house.

Boiler and turbine room building—Concrete and steel construction—**Boiler room:** main floor, El. 36, 196

x 109 ft.; basement, El. 14.5, 196 x 74 ft.; roof, El. 101. **Turbine room:** main floor, El. 36, 207 x 67 ft.; basement floor, El. 207 x 102 ft.; crane rail, El. 72; roof, El. 91. **Office structure:** three stories, 23x67 ft., in east end of turbine room, El. 36, 47 and 57. **Switch house:** Reinforced concrete construction; ground floor,

Fig. 14—Broken ends of bricks after test in fire box at Pasadena steam plant.

El. 14.5, 207 x 85 ft.; switchboard floor, El. 36, 207 x 85 ft.; roof, El. 58. **Foundations:** Natural soil with fir piling, reinforced concrete slab.

Main Apparatus

Turbo-generators—General Electric Company, two sets. **Turbine:** Curtis; horizontal, 40,000 kw., continuous with steam at 350 lb. gage, 70 deg. F. (26 deg. F. superheat), and 1.5 in. mercury absolute back pressure; 20-stage, straight line flow with four bleeding points, 1,500 r.p.m.; steam consumption guaranteed no bleeding, 40,000 kw. 10.10 lb. per kw-hr.; 35,000 kw. 10.00 lb. per kw-hr. **Generator, main:** continuous rating unity power factor 40,000 kva.; rating .9 power factor 38,888 kva.; 11 kv., 3 phase, 50 cycle; excitation required, 38,888 kva. .9 power factor, equals 121 kw. **Generator, auxiliary:** continuous rating 4,000 kva. at .7 power factor, 3 phase, 2,300 volts, 50 cycles; excitation required at rating 31.9 kw. with a 45-kw. 250-volt direct-connected exciter. **Complete unit:** 64 ft. 6 in. long, 20 ft. 3 in. wide, 14 ft. 8 in. high; installed weight 900,000 lb.

TABLE I

	Brick Sample No. 1	2	3	4
Test No. 1	10 blows	24 blows	10 blows	......
Test No. 2	8 blows	11 blows	9 blows	7 blows
Spall test—8 short, 68 medium and 2 long cycles, gas fired				
Break—blows	1	3	3	......
Shrinkage—length	4.1%	1.0%	2.0%	......
Shrinkage—Volume	13.1%	2.4%	4.0%	......
Warp	⅛ in.	1/32 in.	0	......
Warp test—Set on 7-in. span with 4½-in. dimension vertical; cone No. 28 down; estimated cone No. 30 bent (3,100 deg. F); fired 48 hr. with gas				
Break—blows	18	34	28	......
Shrinkage—length	0.6%	0.9%	0.9%	11%
Shrinkage—volume	2.4%	2.1%	1.3%	31.2%
Warp—top 9 in.	7/64 in.	5/64 in.	5/64 in.	......
Warp—bottom 7 in.	9/64 in.	7/64 in.	5/32 in.	......
Kiln fire test No. 1—Set in kiln fire box through normal kiln firing period 4½-in. dimension vertical, 8 days, oil fired.				
Shrinkage—length	4.3%	1.5%	2.0%	......
Shrinkage—volume	12.4%	3.3%	9.4%	......
Furnace test—Set in test furnace; 9-in. dimension vertical; fired 48 hr. with gas; cone No. 30 leaning slightly (3,146 deg. F.); gas fired.				
Break—blows	12	28	16	3
Shrinkage—length	4.7%	1.2%	1.6%	16.6%
Shrinkage—volume	11.8%	3.5%	2.3%	41.3%
Set in fire box; 9-in. dimension vertical; fired 48 hr. with gas.				
Break—blows	7	13	8	......
Shrinkage—length	1.0%	0	2.5%	1.8%
Shrinkage—volume	3.0%	0	6.1%	8.5%
Pasadena boiler No. 10—Set on furnace floor 5½ ft. from Coen mechanical fuel oil burner; fired 55 days.				
Break—blows	5	5	5	......
Shrinkage—length	0	0	2.7%	.7
Shrinkage—volume	2.5%	0	6.2%	4.7%
Boiler No. 11—Set on pedestal; 7-in. span with 4½-in. dimension vertical 39-in. from Coen mechanical fuel oil burner; 18 days.				
Shrinkage—length	3.8%	0	2.9%	......
Shrinkage—volume	11.2%	0	3.2%	......
San Diego boiler No. 23—Set on pedestals; 4½-in. dimension vertical 7 ft. 6 in. from B&W San Diego mechanical oil burners; fired 100 days.				
Shrinkage—length	11.8%	7.6	7.2	......
Shrinkage—volume	40.1%	33.7	34.6	......

Exciter sets (three)—Two 175-kw. dual drive sets, General Electric Company—**Generator:** 175 kw., 250 volt, 2 wire, 6 pole, self-excited, shunt and inter-pole field winding, 1,470 r.p.m. **Motor:** 260 hp., double squirrel cage, constant speed, 2,200 volt. **Turbine:** Curtis impulse, non-condensing, direct-connected. One 350-kw. motor-generator set, General Electric Company—**Generator:** 350 kw., 250 volt, 2 wire, 6 pole, self-excited, shunt and inter-pole field winding, 970 r.p.m. **Motor:** 510 hp., 220 volt, standard squirrel cage, with starting compensator.

Fig. 15—Bricks arranged for test in fire box of San Diego Consolidated Gas & Electric Company plant.

TABLE II.—Analyses of fire bricks tested

Chemist*	Brick sample No. 1 (a) Per cent	1 (b) Per cent	2 (a) Per cent	2 (b) Per cent	3 (a) Per cent	3 (b) Per cent
SiO_2	56.60	56.20	49.50	47.00	53.04	51.50
Al_2O_3	38.10	39.05	44.98	47.80	41.12	42.85
Fe_2O_3	2.08	2.30	1.28	1.55	1.76	1.80
TiO_2	2.00	1.35	2.48	2.15	2.48	1.85
CaO	.73	.56	.41	.75	.50	.70
MgO	0	.75	0	.35	0	1.25
K_2O—Na_2O	.90	....	1.11	....	1.26	....
Ignition loss	.26	....	0	....	.14	....
Total	100.67	100.21	99.76	99.60	100.30	99.95

*One brick of each brand was analyzed, each chemist taking one-half of each brick.

Transformers—Main power: seven, 13,000 kva., single phase, oil cooled and insulated, 11,000 volt, delta to 72,000 volt Y, outdoor type with 110,000-volt bushings, General Electric Company.

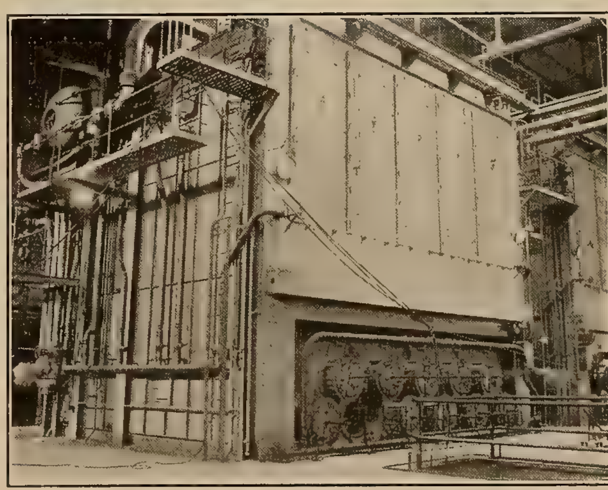


Fig. 16—Boiler in which tests were made by San Diego Consolidated Gas & Electric Company.

Condensers—Two surface type: radial flow, Westinghouse Electric & Manufacturing Company, each with 5,500 sq. ft. of 1-in. outside diameter 20 ft. 3 in. long,

No. 16 B.W.G. cup-drawn Admiralty tubes of Scoville Manufacturing Company, arranged in a cylindrical nest with tubes equally spaced throughout. Shell is shaped so that nearly all of the outer surface of the tube nest is exposed to incoming steam. Air off-take is at center of tube nest. Water boxes are divided and arranged for two-pass operation. Tubes are packed, both ends, with "Dura Metallic" packing and have "Flow Rite"

Fig. 17—Location of bricks in boiler shown in Fig. 16.

nozzles in all inlet ends. **Dimensions: Tube sheets**—15 ft. 2 in. diameter by 1½ in. thick; **condenser**—30 ft. 2 in. long, 20 ft. 3 in. wide, 24 ft. 1 in. high, weight, empty (including tubes), 550,000 lb. **Supports:** 24 pairs springs.

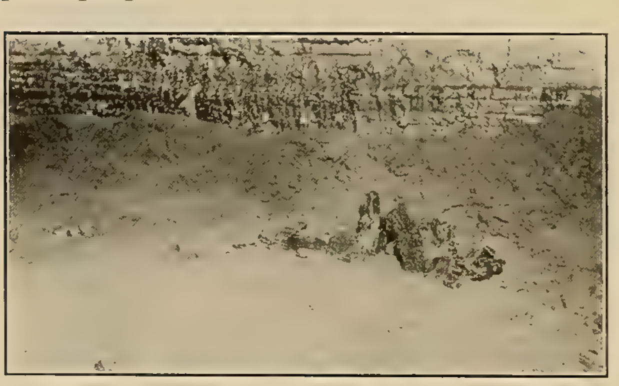


Fig. 18—Bricks after 100-day test, before removing from fire box.

Circulating pumps—Two for each condenser, Westinghouse centrifugal; 35,000 g.p.m., 22-ft. head, double runner, double suction, 290 r.p.m., direct-connected to 250-hp., wound rotor, Westinghouse induction motor, with manual speed control.

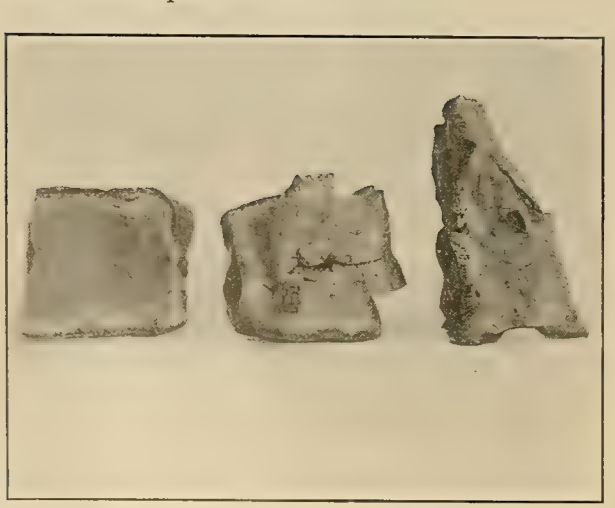


Fig. 19—Showing vitrification after 100-day test.

Condensate pumps—Two Westinghouse pumps for each condenser; 2 stage centrifugal, 1,000 g.p.m., 155-ft. head, direct-connected to 100-hp. Westinghouse induction motor, 960 r.p.m.

Air removal equipment—Two complete Westinghouse units for each condenser; each unit consisting of two 2-stage ejectors with inter and after condenser using condensate and salt water in inter-cooler and condensate in after condenser. **Capacity:** each 2-stage element, 108 lb. per hr. dry air at 28½ in. mercury vacuum, with not over 720 lb. per hr. steam. **Performance, guarantee:** With 70,000 g.p.m. circulating water at 72 deg. F. will condense 350,000 lb. per hr. steam and maintain vacuuc at 1.39 in. mercury, delivering condensate at temperature same as that of steam entering; condensate at the hot well will not contain over .07 c.c. per leader of free oxygen.

Boilers, superheaters and economizers—Eight water-tube boilers, bent-tube type, each equipped with a superheater located between the first and second bank of tubes and economizer at rear:

Boiler (type)	Stirling	Connelly
Manufacturer	Babcock & Wilcox Company	D. Connelly Boiler Company and Llewellyn Iron Works
Number installed	4	4
Water heating surface (sq. ft.)	14,916	15,000
Tubes	3¼-in. o. d. No. 8 B.W.G.	3¼-in. o. d. No. 8 B.W.G.
Mud drums, diameter and plate thickness	48 in.–2.0 in.	48 in.–1.72 in.
Upper drums, diameter and plate thickness	42 in.–1.81 in.	42 in.–1.51 in.
Designed for pressure (lb. per sq. in.)	400	400
Superheater	B&W	Foster
Type	convection	convection
Heating surface (sq. ft.)	3,574	5,780
Pressure drop 250 percent rating lb.	5.1	3.0
Economizer	B&W steel tube	Foster
Heating surface (sq. ft.)	11,095	11,448
Steel tubes—2-in. o. d. No. 6 B.W.G.	plain	with cast iron fins
Boilers setting—		
Mud drum center line above firing floor	13 ft. 1¼ in.	10 ft. 6 in.
Combustion space (cu. ft.)	6,400	5,600
Furnace floor area (sq. ft.)	313.6	315.7
Ratios of heating surfaces—		
Superheater to boiler, percent	24.0	38.5
Economizer to boiler, percent	74.4	76.3
Boiler to furnace volume (sq. ft. to cu. ft.)	2.33	2.68
Furnace volume to boiler hp. 250 percent rating (cu. ft. to boiler hp.)	1.71	1.49

Fuel	Oil or Gas	Oil	Gas
Boiler efficiency percent	73.5	75.1	73.3
Superheat (deg. F.)	280	268	268
Temperature rise, economizer from 285 deg. F.	112	96	80
Flue gases to stack, deg. F.	455	425	420
Over-all efficiency per cent	82.1	82.2	79.0

Performance—boiler, superheater and economizer at 250 percent rating, 375 lb. per sq. in. gage pressure.

Combustion system—Fuel oil pumps: Four screw type, 65 g.p.m., 250-lb. pressure, William E. Quimby, Inc.; three direct connected to 20-hp., 970 r.p.m. General Electric motors; one direct-connected to Westinghouse steam turbine, 1,300 r.p.m **Fuel oil heaters:** four sets two per set each heater 175 sq. ft. surface of ⅝-in. brass tubes, C. F. Braun Company; each set to heat 65 g.p.m. oil from 90 to 275 deg. F. **Fuel oil strainers:** Simplex, C. F. Braun Company. **Fuel oil tanks:** two service—4,500 bbl., underground, reinforced concrete, with heating coils; two storage—30,000 bbl., steel, above ground, 86 ft. diameter, 30 ft. high, with reinforced concrete dike. **Fuel oil temperature regulators:** four Sarco. **Fuel oil transfer pumps:** one—500 g.p.m., rotary, positive displacement, 100-ft. head, 325 r.p.m., Kinney Manufacturing Company, geared to 20-hp., 960-r.p.m. General Electric motor; one—300 g.p.m., rotary, positive displacement, 100-hp. head, 280 r.p.m., with 20-hp., 960-r.p.m. General Electric motor. **Fuel oil piping:** pump suctions—two 8-in. headers with 4-in. pump connections; discharge—two 6-in. headers between pumps and heaters with 4-in. connections to both; two 6-in. header connections from heaters to main headers. **Main header:** loop, 4-in. with 2-in. branches to boilers. **Return line:** single 4-in. line with 2-in. connection at each boiler; pressure regulator to control header pressure by by-passing from main header to return line. Mason Regulator Company. **Relief valves:** Eight, Crane Company. **Expansion joints:** copper, E. B. Badger & Sons Company; velocity flow in 4-in. header, 96 ft. per min. maximum. **Fuel oil emergency cut-off valves:** arranged to close automatically in case of failure of either forced or induced draft fan; eight—2-in.

Tagliabue Manufacturing Company, diaphragm motor operated, each with one Cutler-Hammer solenoid and one Crane Company solenoid operated control valve. **Gas piping**: A 24-in. main enters the building from the metering station, connecting to loop header of 18, 16, 14 and 12-in. pipes with one 10-in. connection to each boiler; velocity of flow in header 9,000 ft. per min. max. **Gas emergency cut-off valves.** To close automatically on failure of either forced or induced draft fan; eight—10-in. Tagliabue Manufacturing Company diaphragm motor operated, each with one Cutler-Hammer solenoid and one Crane Company solendoid control valve. **Burners**: Stirling boilers—each fifteen B.&W., San Diego type mechanical oil burners, with special impeller plate and gas-burning attachment; Connelly boilers—each, fifteen Peabody mechanical oil burners, with modified orifice ring for burning gas. **Fans**: Forced draft—eight No. 7½ R.B., Green Fuel Economizer Company, 60,000 cu. ft. per min., 2-in. static pressure, direct-connected to General Electric 30-hp., 500-r.p.m., slip-ring motors, with variable speed control operated by push buttons on boiler operating board; induced draft—eight No. 8 RR, Green Fuel Economizer Company, 110,000 cu. ft. per min., 4-in. static (Connelly) and 3-in. static (Stirling) pressure, direct-connected to General Electric 100-hp., 326 to 540-r.p.m., brush-shifting motor, with variable speed control operated from boiler control board. **Boiler furnaces**: ventilated walls—all walls of high-temperature zone are 9 in. thick of high-grade firebrick bonded to steel casing frame, with forced ventilation through air ducts between brick and casing; furnace floors—have forced ventilation also; Stirling furnaces—have brick bonded to frame by means of the B.&W. method; Connelly furnaces—have brick bonded to frame by means of the Combustion Engineering Company method; firebrick—used for high-temperature zones was approximately as follows: 180,000 A.P. Green Firebrick Company, Mizzou brand; 75,000 Walsh Fire Clay Products Company, XX brand; 86,000 Vitrefrax Company, Argon AA dry pressed brand. **Draft loss**: furnaces to stack, 250 per cent rating—Stirling 1.08 in.; Connelly 3.5 in. water. **Boiler casings**: sheet steel panel construction with 4 in. of heat insulating material between the air ducts and outside sheets; magnesia block insulation was used for Stirling casings and silocel plastic for Connelly boilers. **Stacks**: four—one for each two boilers, superimposed reinforced concrete construction, unlined, built by Webber Chimney Company, 13 ft. 4 in. inside diameter at top, 73 ft. 8 in. high, set on concrete matt on building structural steel with top of stacks 126 ft. above furnace floor.

Steam piping system—High-pressure steam: (375 lb., 700 deg. F.), main and auxiliary headers, main branches and boiler blow-off; extra strong lap-welded steel pipe, cast steel fittings, with Sargol joints. **Main steam header and turbine branches**: 18 in. outside diameter by ⅝ in. thick, and boiler branches, 10 in. diameter by ½ in. thick, Pittsburgh Valve Foundry & Construction Company; main headers 147 ft. long, anchored at turbine, branch connections with 27-ft. high expansion bend at center; pipe bends on 7-ft. 6-in. radius. **Auxiliary steam piping**: M. K. Mitchell & Company. **Boiler blow-off piping**: Grinnell Company. **Valves**: cast steel, Monel trim, main header and branches—three 18-in., eight 10-in., gate valves, Pittsburgh Valve, Foundry & Construction Company; boiler non-return—four 10-in., eight 8-in., Schutte & Koerting Company; auxiliary steam lines—gate, Crane Company, globe, Edward Valve & Manufacturing Company; reducing and regulating valves—steam, Fisher Governor Company and Mason Regulator Company; relief valves—175-lb. auxiliary steam lines, Consolidated Safety Valve Company. **Miscellaneous**: Motor operating equipment—for eleven main steam valves, Payne Dean, Ltd.; drip system—Holly, Russell B. Hobson; high-pressure traps—two C. E. Squires Company; pipe covering—all 700 deg. F. steam pipes have inner covering of diatomaceous earth, magnesia and asbestos fiber, with outer covering of 85 per cent magnesia; other steam and hot water piping covered with 85 per cent magnesia; all covering is of Johns-Manville manufacture applied by the Asbestos Manufacturing Company of California. **Velocity of flow**: high-pressure steam—boiler outlets, 8,700 ft. per min., maximum; main header, 11,700 ft. per min., maximum, 8,800 ft. per min. normal.

Boiler feed water system—Feed pumps: Four 5-stage, 1,000 g.p.m., Jeansville double suction, centrifugal, made by Worthington Pump & Machinery Corporation for 440-lb. discharge head with 150-lb. pressure on suction, three direct-connected to General Electric 250-hp., 1,460-r.p.m. slip-ring motors, one direct-connected to Westinghouse steam turbine, 1,570 r.p.m. with variable speed governor. **Booster pumps**: Four 2-stage, single suction, 1,000 g.p.m., centrifugal, Byron Jackson Pump Manufacturing Company, direct-connected to 100-hp., 1,450-r.p.m., constant-speed, General Electric motors. **Feed pump regulators**: Each motor-driven pump has a 3-step manual variable speed control with automatic speed control of four steps for each step of manual, automatic control by means of Ruggles Clingman regulator; the turbine-driven pump is equipped with Fisher Governor Company pressure regulator. **Boiler feed regulators**: Sixteen sets controllers, Williams Gage Company, two on each boiler, 3-in. **Feed water heaters**: Two sets, five heaters in each set made by Griscom Russell Company, each set—one 18th-stage heater, 4-pass, with 1,950 sq. ft. Muntz tubes; one 18th-stage heat exchanger, "Multiwhirl," with 67.5 sq. ft. Muntz tubes; one 11th-stage heater, 4-pass, with 2,090 sq. ft. of Admiralty tubes; one 11th-stage heat exchanger, single-pass, with 350 sq. ft. Muntz tubes; one Gland steam condenser, 6-pass, with 735 sq. ft. Muntz tubes. **Evaporators**: Two sets, Bethlehem Shipbuilding Corporation, double effect, submerged-tube type, each set—two Bethlehem-Weir vertical, low-pressure, single-effect evaporators, each with 450 sq. ft. surface of coiled copper tubes; one evaporator condenser, 2-pass, with 650 sq. ft. straight copper tubes; one evaporator preheater, single-pass, with 50 sq. ft. of straight copper tubes; one blow-off pump, Hytor, Nash Engineering Company, direct-connected to ½-hp. motor; performance—each set to produce 17,500 lb. per hr. of distilled water with not over 1 grain per gal. total solids from raw water containing about 25 grains per gal. total solids, steam supply to be from 15th stage of turbine, 12,970 lb. per hr. at 19.5-lb. absolute pressure. **Deaerators**: Two Cochrane Corporation, reboiling type, each—one vertical open heater, 9 ft. 3 in. diameter by 10 ft. high inside, with heating and deaerating trays; one vent condenser, 3-pass, with 430 sq. ft. straight tubes; one vacuum pump, Hytor, Nash Engineering Company, direct-connected to motor; performance—each deterator to reduce the oxygen content of 400,000 lb. feed water per hr. to .03 c.c. per leader when supplied with 14,430 lb. steam per hr. from the 15th-stage bleeding point. **Tanks for feed water**: One 68,000-gal. distilled water tank, reinforced concrete, under boiler-room basement; two 6,000-gal. steel surge tanks on boiler-room roof. **Tanks for raw water**: Two 6,000-gal. reinforced concrete in bases of stacks; two 2,000 gal., steel bearing cooling reserve supply; one 36-ft. diameter by 110 ft. high, steel standpipe 750,000-gal. capacity (storage for both No. 1 and No. 2 plants); well water pumps—to raise well water from standpipe to 6,000 and 2,000-gal. tanks in top of boiler room, float-controlled: two 2-stage centrifugal, 500 g.p.m., 160-ft. discharge head, Pacific Pump Works, direct-connected to 30-hp., 1,450-r.p.m General Electric motors. **Piping**: Feed water, 10-in. line from pumps to two mains and one auxiliary 8-in. header, 4-in. branches to economizers and two 3-in. lines between economizers and boilers, extra strong lap-welded Grinnell Company. **Valves**: **Low-pressure steam**—steam to evaporators: twelve hydraulic cylinder operated 14-in. Pittsburgh Valve, Foundry & Construction Company; steam to 18th-stage heaters: two 20-in. Pittsburgh Valve, Foundry & Construction with Payne Dean motor operation; steam to 11th-stage heaters; balance to check valve, two 8-in. Atwood & Morrill; **High-pressure steam**—gate, globe and check, Crane Company, cast steel hard metal trim. **Expansion joints**: Copper, E. B. Badger & Sons Company. **Velocity of flow**: 623 ft. per min., maximum. **Miscellaneous pumps**: Two emergency distilled water pumps, single stage, double suction, centrifugal, 9,000 g.p.m., 100-ft. discharge head, Byron Jackson Pump Manufacturing Company, direct-connected to 40-hp., 1,440 r.p.m., constant speed, General Electric motors, service, raise water from distilled water storage tanks under boiler room to surge tanks on roof, float control; four evaporator drip pumps, 2-stage, centrifugal, 75 g.p.m., 147-ft. discharge head, Byron Jackson Pump Manufacturing Company, direct-connected to 10-hp., 1,440-r.p.m General Electric motors; four 18th-stage heater drip pumps, 2-stage, centrifugal, 75 g.p.m., 147-ft. discharge head, Byron Jackson Pump Manufacturing

Company, direct-connected to 10-hp., 1,440-r.p.m. General Electric motors.

Cooling System—Cooling water is taken from a ship channel, conducted to and from the plant through reinforced concrete tunnels. **Head works:** reinforced concrete on piling. **Settling basin:** 110 ft. across, mouth converging to the screens 72 ft. from the mouth, with wall dividing the basin in the center, weir is at El.—5.5, across the mouth; screens—bar grizzlies across mouth; four 10 ft. wide traveling screens at tunnel end of settling basin, Chain Belt Company; gate wells and gates provided for stopping the flow to either half of settling basin or any of the tunnels. **Tunnels: intake**—three 7 ft. sq. by 950 ft. long with bottom at El.—13 connect the headworks to the manifold located between the old and new plants; intake under plant—two 7 ft. sq., narrowing to 3 ft. wide, approximately 224 ft. long with bottom at El.—14; **discharge under plant**—approximately 185 ft. total length of 7 ft. 6 in. high by 3 ft. to 5 ft. wide, reinforced concrete with bottom at El.—5.5, located just over the intake tunnel; **discharge outside of plant**—discharge tunnels from both ends of the building unite near the center of the south building line in one 10-ft. diameter main discharge tunnel with bottom at El.—11, length 542 ft. to the outlet structure. **Outlet structure:** reinforced concrete in piling 58 ft. long, 16 ft. wide with tunnel extending into the outer end, bottom of structure El.—15, bottom of tunnel El.—11, top of end structure El. 6, water outlet weirs El. 1; four horizontal 6x6 ft. outlet openings are provided in the top of the structure, provided with sheet-steel doors. **Manifold:** gate and access wells for each of the three main and one auxiliary intake tunnels; gate, access and stationary screen wells for two tunnels into No. 2 plant and one tunnel into No. 1 plant; pump and piping for unwatering of any of the seven connecting tunnels. **Water velocities:** in tunnels outside of buildings—195 ft. per min. maximum in intake; 250 ft. per min. maximum in discharge; condenser tubes 215 ft. per min. or 3.58 ft. per sec., maximum.

Condenser cooling system—Piping: 42 in. cast iron, two lines to and from each condenser. **Valves:** eight 42 in. Pittsburgh Valve, Foundry & Construction Company, with Payne Dean motor-operating equipment. **Expansion joints:** rubber, U. S. Rubber Company. **Pumps:** See condenser.

Generator cooling system—Main and auxiliary generator closed circuit air circulating through fin-type, tubular coolers with salt cooling water. **Air coolers:** General Electric Company. **Pumps:** two, single stage, centrifugal, 1,500 g.p.m., 65-ft. head, DeLaval Steam Turbine Company, direct-connected to 40-hp., 1,450-r.p.m. General Electric motors. **Piping:** 8-in. cast iron lines, interconnected with low service pumps and reserve tanks. **Strainers:** four 10 in., C. F. Braun Company, single basket.

Transformer cooling system—Oil circulated through coolers with salt cooling water, one oil cooler and one oil pump for each transformer. **Oil coolers:** seven 2-pass, "Multiwhirl" vertical, Griscom Russell Company, 131 sq. ft. of ⅝-in. tubes. **Pumps: oil circulating**—seven 100 g.p.m., 67-ft. head, single stage centrifugal De Laval Steam Turbine Company, direct-connected to 5-hp., 1,450-r.p.m. General Electric motors; **salt cooling water**—one single stage centrifugal, 1,500 g.p.m., 65-ft. head, De Laval Steam Turbine Company, direct-connected to 40-hp., 1,450-r.p.m. General Electric motors. **Piping:** 8-in. cast iron lines interconnected with low service salt water pumps and reserve tanks. **Strainers:** two 10 in., Andale Engineering Company, single basket. **Low service pumps:** two 1,500 g.p.m., 125-ft. head, single stage centrifugal, De Laval Steam Turbine Company, direct-connected to 100-hp., 1,450-r.p.m. General Electric motors; **piping**—8 in. cast iron connecting to headers of air-cooling and transformer-cooliing systems; **strainers**—four, Andale Engineering Company, single basket. **Reserve tanks:** salt water—two, 6,000-gal. reinforced concrete tanks in stack bases (low service pumps are controlled automatically from the level of water in these tanks). **Regulating valves:** two 8 in., Kieley & Mueller. **Turbine lubricating oil cooler:** two for each unit, Andale Engineering Company. **Air** ejector intercoolers and turbine lubricating oil coolers take salt water from the low service lines. Bearing cooling water is drawn from the two 2,000-gal. steel fresh water tanks under roof of boiler room.

Miscellaneous Equipment

Lubricating oil purifying and handling equipment—Purifiers: two continuous by-pass filters, S. F. Bowser & Company; one centrifugal purified, De Laval Separator Company. **Pumps:** one 100 g.p.m., 50-ft. head, rotary, Blackmer Rotary Pump Company, geared to 5-hp. General Electric motor.

Priming system—Pumps: two, Hytor, Nash Engineering Company. Steam jets: two, Schutte & Koerting.

Sump pumps—Building drains: two vertical 300 g.p.m., 3 in., 20-ft. head, Worthington Pump & Machinery Corporation, direct-connected to 5-hp., 960-r.p.m. General Electric motors. **Atmospheric relief and back pressure valves:** two 36 in., and four 12 in., Atwood & Morrill Company.

Ventilating fans—Switch house: three 7,500 cu. ft. per min., one 10,000 cu. ft. per min., Green Fuel Economizer Company, direct-connected to General Electric motor.

Transformer oil filters—Two 30 g.p.m, 12 in., and one 10 g.p.m., 7 in., General Electric Company.

Condenser electrolytic protection—Kirkaldy system: Two sets, 32 electrodes each, with one switchboard, Kirkaldy Engineering Corporation; two motor-generator sets, 1kw., 4-volt, d.c. generator with exciter, both direct-connected to General Electric motor.

Air compressor—One 17 x 10 x 14-ft., 2-stage, 500 to 600 cu. ft. per min., 100-lb. pressure compressor, Ingersoll-Rand Company, belted to 150-hp. General Electric motor.

Crane—Overhead traveling in turbine room: One Shaw crane 100-ton main hoist, 15-ton auxiliary, 4 electric motors, 64-ft. 9½-in. span, Manning, Maxwell & Moore.

Fire-fighting equipment—Fire pump: One 2,000 g.p.m., 206-ft. dicharge head, single-stage centrifugal, De Laval Steam Turbine Company, direct-connected to 175-hp., 1,450 r.pm. General Electric motor. **Fire pipe lines:** 10 in. cast iron pump suction and discharge with two 12-in. Andale Engineering Company strainers in suctions; 8-in. cast iron line around building; four risers in the main building are equipped with valves and hose racks at the various floor levels; five Corey fire hydrants are located about the station yard. **General fire protection:** Each main and auxiliary generator is equipped with tetrachloride and fresh water sprays in the end housings, one 10-gal. carbon tetrachloride extinguisher being provided for the generators of each unit. **Switch house fire protection:** Two 20-gal. carbon tetrachloride extinguishers are installed in the switch house with an outlet nozzle in each circuit breaker room controlled from the main switchboard room, portable 1-gal. extinguishers also are available; **stationary extinguishers**—Oil Conservation Engineering Company; **portable extinguishers**—Phister Manufacturing Company.

Elevator—One combination freight and passenger 4,000-lb. capacity, 85-ft. lift, push-button control, electrical operation, Otis Elevator Company.

Signal system—An illuminated signal pedestal is provided for each turbine in both the turbine and boiler rooms, controlled from the main control switchboard; telephones are provided at each unit.

Metering and Test Equipment

Indicating pressure gages—Ashcroft Manufacturing Company and Foxboro Company.

Master steam gage—30 in., Ashton Valve Company.

Indicating thermometers—Taylor Instrument Companies; **Dial type**, The Foxboro Company.

Vacuum gages—Mercury column, Taylor Instrument Companies.

Recording pressure and vacuum gages—The Foxboro Company.

Recording thermometers—The Foxboro Company.

Recording liquid level gages—The Bristol Company.

Boiler control meters—One on each boiler; record and integrate steam flow; record gas flow through boiler and flue gas temperatures leaving boiler and economizer, Bailey Meter Company.

Boiler control gage—Multipointer, certical scale, Bailey Meter Company, one on each boiler, indicates: air pressure at forced-draft fan, burners; draft—over

fire, at boiler exit, at economizer exit; gas pressure at burners; fuel oil pressure at burners; temperature of feed water leaving economizers.

CO_2 recorder—One on each boiler, Mono, duplex, CO_2 and CO meters, C. J. Tagliabue Manufacturing Company.

Fuel oil meters—Two 4-in. and one 3-in. Bassler, American Liquid Meter Company.

Natural gas meters—Two 10 x 5-in. Venturi tubes, one for each test boiler, with one manometer, Builders Iron Foundry.

Fuel oil tank gaging equipment—One gage connected to two storage tanks, Pneumercator Company.

Boiler feed meters—Two 10 x 5-in. Venturi tube meters in feed pump discharge lines, with indicating, recording and integrating mechanism, Builders Iron Foundry.

Steam flow meters—Stationary electric type, indicating, recording, integrating; two 18-in. steam to turbines; two 8-in. steam to auxiliary header, General Electric Company. **Portable:** indicating type; one 2-in. steam flow to air ejectors, General Electric Company.

Water flow meters—Indicating, recording, integrating, electrical type: two 8-in. in condensate lines, General Electric Company. **Indicating, recording:** Four 42-in. in circulating water lines to condensers, H. S. B. W. Cochrane Corporation. **Integrating disk type:** two 2-in. 125-g.p.m. water to evaporators, Trident, Neptune Meter Company.

Oil flow meters—Indicating: Seven on transformer oil, General Electric flow nozzle, Builders Iron Foundry manometers.

Salinometer—Condensate lines: One 2-point recorder, Leeds & Northrup Company.

Watchman's clock system—Newman, 30 station.

Smoke detectors—for generators, Walter Kidde & Company.

Load and demand indicators—two double-faced Westinghouse Electric & Manufacturing Company.

Test scales—For condensates: two 20-ton tank, Howe Scale Company. **For fuel oil:** one 4-ton tank, Fairbanks-Morse & Company.

Meter and gage boards—Bangor, Pa. Slate, Los Angeles Marble & Tile Company.

Station Details Alameda Street Plant

The following data are submitted in reference to the latest turbines installed in the Alameda Street plant of the Los Angeles Gas & Electric Corporation:

Power Station Arrangement

Turbine and generator—Type: Curtis turbine, General Electric Company. **Steam pressure:** 200-lb. gage. **Temperature:** 488 deg. F. **Bleeder points:** Steam being bled from the 3rd stage at present, 4th stage bleeder to be installed. **Capacity:** 17,500 kw. at .8 power factor. **Water rate:**

Lb. steam per kw-hr.	Kw. load
14.85	7,500
13.85	11,250
13.90	15,000
14.20	17,500

These figures for 200-lb. gage pressure, 100 deg. superheat and maximum back pressure of 3 in. absolute in exhaust chamber of turbine; speed: 1,800 r.p.m., 60 cycles; voltage: 2,400; **Began service:** Aug. 12, 1924.

Condenser—Type: Cylindrical, surface condenser, Wheeler Condenser & Engineering Company. **Cooling surface:** 40,000 sq. ft., 4-pass. **Tube material:** 1 in. outside diam. No. 18 B.W.G. seamless drawn copper, 16 ft. long; approximately 10,000 tubes. **Tube arrangement:** Multipitch plan. **Packing:** John Crane metallic. **Cooling water:** 40,000 g.p.m. at 80 deg. F. to maintain 28.12 in. vacuum when condensing 225,000 lb. steam per hr.; water is in circulation over cooling tower and makeup is of Zeolite-treated water. **Pressure drop:** Through the condenser including gate valves and expension joint is 15 lb. per sq. in.

Condenser air removal equipment—Type: One size G, 2-stage, steam-jet air pump, Wheeler Condenser & Engineering Company. **Position:** air pipes leave condenser about 30 in. below center line of water box. **Steam consumption:** 2,400 lb. steam per hr. required for air removal.

Condensate pumping equipment—Type: Two 5-in., bronze-fitted, double-suction, horizontally split casing type centrifugal pumps, Wheeler Condenser & Engineering Company. **Pumping head:** 111 ft.

Turbine oil-cooling and purifying equipment—Type of oil-cooler: vertical, Schutte & Koerting. **Cooling surface:** 370.5 sq. ft. **Cooling water:** taken from cooling tower pond. **Tube material:** ½-in. brass tubes in cooler. **Type of oil purifier:** Richardson Phoenix filter.

Turbine air washing or cooling equipment—No air washing equipment installed.

Exciters—Type: Direct-connected to turbo-generator shaft, General Electric Company. **Capacity:** 135 kw., 125 volt.

Circulating water pumps—Dual drive, Wheeler Condenser & Engineering Company, direct-connected to 800-hp. General Electric induction motor and 800-hp. Terry turbine through a De Laval reduction gear; constant speed is maintained. **Capacity:** 40,000 g.p.m. at 50-ft. head.

Instruments (steam plant only)—Bristol strip-chart instruments are used for all purposes where recording instruments are used for recording steam temperature; recording vacuum gage; recording thermometers on circulating water inlet and outlet. Ashcroft gages on circulating water line and condensate lines. Tagliabue mercurial thermometers are used for temperature of bearing oil and to check recording thermometers.

Boilers and superheaters—Type: Stirling boilers and B.&W. superheaters, Babcock & Wilcox Company; boilers are of the integral-economized type. **Heating surface:** 8,900 sq. ft., pressure 250-lb. gage. Superheater B.&W.: 254 tubes, plugs are used. **Economizers:** wrought steel, integral with the boiler and contain 2,403 sq. ft. of heating surface; the pressure through the dry pipe is approximately 5 lb. at 200 per cent rating.

Furnace and burners—Burners are of the San Diego type, Babcock & Wilcox Company; 6 burners to the surface. **Furnace volume:** 2,600 cu. ft., brick. McClintisk and A. P. Green. **Side walls:** 22 in. thick. **Front walls:** 9 in. thick to a point 7 ft. 6½ in. above the floor and 18 in. thick above that point. **Rear walls:** 13 in. thick, red brick. (Boilers are in batteries of two, center wall is common to two boilers and is 36 in. thick.) Walls are unventilated and the floors have a 6-ft. space between the foundation, which is solid, and the furnace bottom. (This space is arranged so that the air will circulate under the furnace floor, up the boiler front, into the furnace.) **Draft:** Natural. Burners are located in the lower section of the boiler front and in two rows of three burners each.

Stack—200 ft. high from boiler room floor; 102-in. dia., made of boiler plate, no lining. Stack supported by triple set of guy lines, quartering on stack.

Fuel equipment—Pumps: Three 10 x 7 x 10-in. Blake Knowles, vertical duplex piston pumps, type LO, 300-lb. oil pressure. **Heaters:** 295 sq. ft. Griscom Russell. **Storage and service tanks: two storage**—One 30,000 bbl., the other 50,000 bbl.; **service: five**—combined capacity 26,000 bbl. No combustion control installed.

Feed water equipment—Pumps: De Laval centrifugal 3-stage, 650 g.p.m. **Heaters:** Open type, 325,000 lb. of water per hr., Elliott Company. The makeup water is evaporated and is supplied from the city service mains, first being put through a Permutit softening plant. **Reserve capacity:** 80,000 gal. Wheeler evaporators and Elliott deaerators are used.

Instruments, boiler room—Tag-Mono duplex recorders on flue gas analysis; Republic flow meter to measure water to each boiler; Bristol strip-chart instruments for recording steam pressure, feed-water pressure, steam temperature in header and oil pressure and temperature; General Electric recording watthour meter for turbine; Esterline-Angus recording concentration instruments.

Piping layout—The velocity of the steam from the header to the turbine is approximately 11,000 ft. per min. in a 14-in. line. The header expansion bends are complete circles the radius being 6 ft., 8 in., the ends being offset to make the header line up. Two bends with a radius of 10 ft. each are located in the supply line to the turbine to provide flexibility. The valves on the steam headers are hand-operated gate valves. The valves on the circulating water lines are hydraulically operated and remote-controlled. The water for operating them is taken from the boiler feed lines.

Signal system—Turbine and engine room: The signal system is of the annunciator type. Annunciators are installed in the boiler and turbine rooms and the operators' gallery. Whistles are installed which call to the

annunciator, three blasts for individuals and two for machine operation.

The following is submitted by the apparatus bureau as a report on steam plant layout and pertains to the Alameda Street station of the Los Angeles Gas & Electric Corporation.

Main generators—Three 17,500-kw., one 10,000-kw., one 6,000-kw. and one 4,000-kw. generators, all 2.4-kv., 3-phase units; cooled by air circulated from fans directly mounted on shafts; excitation supplied from 125-volt, direct-connected exciters, floating on a common bus in parallel with 125-volt, 175-amp.-hr. battery; system operated underground at present; generator leads are made up of flat bus mounted on insulators and carried in separate concrete compartments, excepting one machine which has six 1,500,000-circ. mil lead-covered cables in parallel, pulled through fiber ducts; machine temperature is taken every half hour from coils imbedded in winding; only means of fighting fire is by portable equipment and dampers in air shaft.

Station light and power—Taken from main bus, excepting emergency light and excitation which is taken from 125-volt, 175-amp.hr. battery.

Switchboard and instruments—Panel boards with horizontal, edgewise instruments are arranged in six groups: machines, exciters, tie lines, 15-kv. lines, 2.4-kv. feeders and 500-volt feeders; located on second floor in building across the street from main generating station; intercommunication accomplished by a 50-phone automatic telephone system, and by an annunciator system that is visible in every department of the plant and can be operated from a number of stations, conveniently located; attention is called to annunciator by steam whistle.

Transformers—**Four banks:** oil-filled, water-cooled, consisting of two banks 20,000-kva. and two banks 10,000-kva. General Electric transformers; 2.4 kv. low

TABLE III

Assumed data

Steam pressure	365 lb. absolute
Steam temperature	700 deg. F.
Extraction at stages	11, 15, 18
Evaporators	
Make up supply percent of steam and condenser	5
Operation—double effect	
Temperature of make-up water	62 deg. F.
Vacuum	28.5 in.
Total load including load on main generator, house generator and house generator exciter	39,200 kw.

Computed data

Item	Steam Lb.	Lb. per hr.	Pressure Lb. absolute	Temp. Deg. F.	B. t. u. per lb.
Steam to main header		432,567	365.0	700	1,358.0
Subtract steam for air ejectors	1,440		175.0		
Steam to turbine throttle		431,127	365.0	700	1,358.0
Steam to gland leak-off	5,370		14.7	638	1,350.0
Steam bled at 11th stage	35,266		81.3	429.6	1,243.0
Steam bled at 15th stage					
Evaporators	11,890		19.6	227	1,143.0
Deaerator	15,511		19.6	227	1,143.0
Steam bled at 18th stage	18,250		3.64	149.1	1,056.8
Total steam bled (20.03 percent)	86,387				
Steam to condenser		344,740	.738	91.9	984.1
Condensate					
From steam in condenser		344,740	91.9		59.9
Add condensate from inter cooler		360	141.0		109.0
Total from condensate pump		345,100	92.0		60.0
Leaving 18th stage heater		345,100	143.1		111.0
Leaving 18th stage heat exchanger		345,100	144.5		112.4
Add 18th stage drips					
From gland steam desuperheater	1,080				
From 18th stage steam	18,250				
From gland steam	5,370				
From condensate from after condenser	1,080				
Total		25,780	149.1		117.0
To evaporator condenser		370,880	144.8		112.7
Leaving evaporator condenser		370,880	171.4		139.3
Add evaporator drips composed as follows:					
Steam to evaporators at 19.6 lb.		11,890	227.0		1,143.0
Raw water fed		18,100	62.0		30.0
Less evaporator blow off		863	172.0		140.0
Total evaporator drips to system		29,127	177.4		145.3
To inter cooler		400,007	172.4		140.3
From inter cooler		400,007	175.4		143.5
Deduct condensate used to desuperheat gland steam which is returned to system with 18th stage drips		1,080	175.4		143.5
To gland steam condenser		398,927	175.4		143.5
Leaving gland steam condenser		398,927	190.5		158.4
To deaerator		398,927	190.5		158.4
Add steam to deaerator		15,511	227.0		1,143.0
Leaving deaerator		414,438	227.0		195.2
Condensate leaving deaerator		414,438	227.0		195.2
Add drips from 11th stage heat exchanger composed as follows:					
Condensate used to desuperheat 11th stage steam		1,900	234.0		202.5
Eleventh stage extraction steam		35,366	429.6		1,243.0
Total 11th stage drips to system		37,266	234.0		202.2
Condensate to 11th stage heat exchanger		451,704	227.6		195.8
Condensate from 11th stage heat exchanger		451,704	234.2		202.5
Deduct condensate used to desuperheat 11th stage steam which is returned to system with 11th stage drips		1,900	234.2		202.5
Condensate to 11th stage heater		449,804	234.2		202.5
Condensate from 11th stage heater		449,804	307.0		276.8
Condensate to economizers*		449,804	307.0		276.8
Condensate to each economizer†		112,451	307.0		276.8
Condensate from each economizer†		112,451	381.0		355.0

*The quantities to each economizer, and temperatures leaving would depend on the rating at which the boilers were operated.

†This is assuming four boilers on this load.

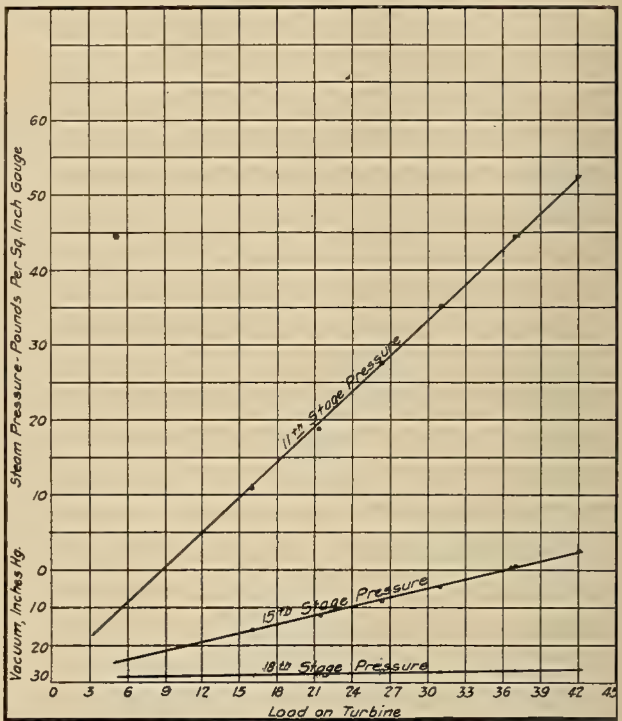


Fig. 21—Stage pressure of turbine No. 8, Long Beach steam plant No. 2, when extracting.

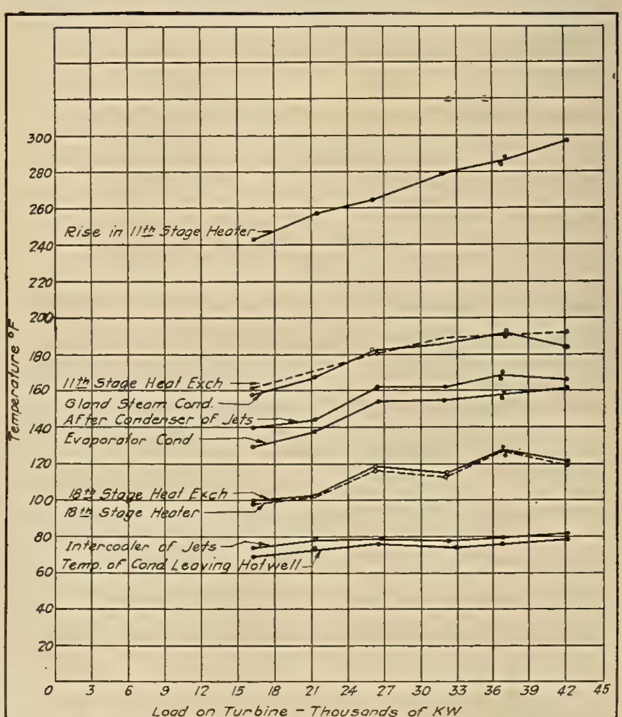


Fig. 22—Condensate temperatures throughout feed water heating system, turbine No. 8, Long Beach steam plant No. 2.

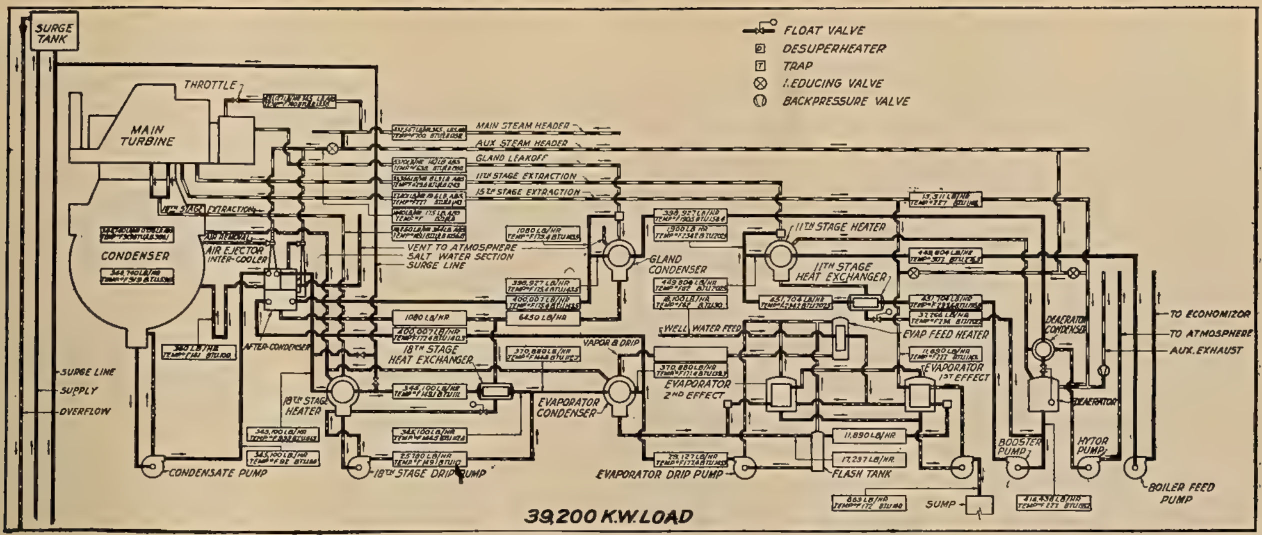


Fig. 20—Heat balance diagram for Long Beach steam plant No. 2.

side, 32.7 kv. high side, operating at present at 16.35 kv., connected delta on the high and low sides. The 20,000-kva. banks are each operated as a unit with a 17,500-kw. turbine; 10,000-kva. banks are used as transfer between high and low buses. All transformers and regulators get their cooling water direct from the discharge of turbine circulating pumps, water being supplied through check valves from each pump. They can also be supplied from city water.

Generator switches—General Electric type, FH-206 oil circuit breakers: Located in switch house some distance from generator, mounted in concrete switch cells; ordinary type of disconnecting switches are mounted directly beneath oil circuit breakers in concrete compartments, buses are the same.

High-voltage switches—General Electric type, FH-209 oil circuit breakers: Installed in the same way as the generator oil circuit breaker; same installation for disconnects.

Feeder equipment—All feeders fed from a double bus, through oil circuit breakers and disconnecting switches, then through 3-phase feeder voltage regulators, to a 3-conductor lead cable which leads to underground system. Oil circuit breakers, disconnecting switches and buses are installed in concrete compartments on second floor of switch house. Regulators are located on first floor of same building, and the underground system comes in the basement.

Protection—**For generators:** Definite time overload relays and differentially connected relays. **For transformers:** differentially connected relays; high lines by induction over-current relays; feeders by inverse time relays and a system of sectionalizing reactors. **For outgoing high lines:** Oxide film lightning arresters installed on each of the outgoing high lines and one on the 2.4-kv. bus.

Heat Balance

The following data in Table III, submitted by L. J. Kraps of the Southern California Edison Company, gives the calculated heat balance for one of the 40,000-kw., 20-stage Curtis horizontal turbines of the new Long Beach steam plant No. 2.

Fig. 20 shows the above data in the form of a heat balance diagram. Figs. 21 and 22 show actual stage pressures and condensate temperatures for various loads as obtained by test on No. 8 unit at the Long Beach plant No. 2.

Direct-Mail Advertising

By J. CHARLES JORDAN

EFFECTIVE advertising long ago has been outlined as follows: It must be seen; it must be read; it must be believed; and it must cause the reader to want the thing advertised. In in the olden days when communities were small and the territory sparsely settled sales were made mostly by personal contact. Such contacts were limited by the salesman's knowledge of the community and his own reputation. With the influx of population and the growth of industries new methods of selling became necessary, and one of the greatest aids is that of direct-mail advertising. This type of advertising has the advantage of being private. You can reach one or thousands at one time. It also has an important place in any business which seeks to build up and retain the good will of its customers. That it is a powerful adjunct to any business regardless of its preferred methods of advertising is indicated by the spectacular growth of this type of advertising during the past few years.

The public utilities continue to find greater need for personal contact and will continue to use more extensively direct-mail advertising. Sales departments of the utilities maintain selling lists of prospects for various classes of service rendered and for appliances best fitted to the needs of the prospects. Departments of public relations maintain lists in order to keep citizens personally informed of the activities within their various communities. Financial departments of the utilities through letters, magazines and other direct-mail mediums keep the stockholders advised of the company's development and its financial standing. In the building of good will and better public relations direct-mail advertising furnishes a medium through which the utilities can contact with each of their consumers served. It is manifestly impossible for the executives of the public service companies to meet all of the company's customers in person. This, however, can be done through the mails. Just as satisfied customers make a business grow, so does efficient direct-mail contact aid in confidence building that makes satisfied customers.

Publicity and Its Code of Ethics

By AL. C. JOY
Chairman News and Advertising Section

AS the result of effort started shortly prior to the Pacific Coast Electrical Association's convention of 1924, the past year's work of the Publicity Section has been devoted to intensive and cooperative study of publicity and advertising questions. Previously under the label of publicity committee it had been hazy as to its position in the Association. Even its older members had not been clear as to its functions, the committee regarding itself as a publicity body for the Association rather than as a body of representatives of Association units called together to give each other the benefit of experience which might be carried into every-day work. With a new understanding of its purposes, the committee occupied its two half-day sessions at the 1924 convention with carefully prepared papers on publicity and advertising topics, all of which brought forth much profitable discussion.

More important, however, was the determination at this convention to reorganize as a News and Advertising Section, with a definite organizational setup and a different program of work. Our place in the industry is established; it is important. Our group is composed of trained men who obviously should profit as greatly by the exchange of ideas and the joint consideration of problems as any other group in the Association.

Raising of Publicity Standards

In submitting this report of the past year's activities the chairman of the section believes that much good has been accomplished under our new working methods. There has resulted a more sincere and thorough study of publicity and advertising methods and values; an exchange of opinions and experiences by which all members have benefited; and the translation into concrete form of a code of ethics, which previously had existed only as the standards of individual workers.

Obviously publicity men must come into constant contact with the press. They must have knowledge of what the press wants, what it will publish, and why it will publish it. They must have a distinct understanding of the fine differences between publicity and propaganda and of the differences between news and advertising. In the establishment, therefore, of a code of ethics it has been the thought of the section not only to establish better standards for itself and a higher respect among ourselves for the particular work in which we are engaged, but a better understanding of and a higher respect for ourselves among the newspaper men who are our most important contact.

Three Working Bureaus Formed

Two meetings of the section have been held up to the time of the preparation of this report, with another one in prospect prior to the convention.

Preceding the first meeting the chairman had appeared before the executive committee to request that henceforth we should be known as the News and Advertising Section. This request was granted. At the first meeting held on Nov. 21, 1924, in San Francisco, the new name was adopted and a plan of organization agreed upon.

The bureau of technique has had under its consideration the study of advertising, illustrations, moving pictures, news articles and their values, and internal publications and house organs.

The better business bureau has had as its main purposes the consideration of cooperative methods of publicizing and advertising, the establishment of ethical standards under which publicity and advertising work shall be conducted, and the safeguarding of stockholders of utilities from fraudulent promotion schemes. In this latter connection we have sought to keep in touch with the better business bureaus of the Associated Advertising Clubs of the World, supporting the advertising clubs' principle of truth in advertising and striving to protect stockholders from attempts to trade them promotion stocks in questionable enterprises for their valuable public-utility securities. Each department of our own better business bureau's activities has been in charge of a separate committee.

The committee on cooperative methods has given its time chiefly to the problems of the manufacturers and dealers in the electrical appliances.

Under the officers and an executive committee there was set up a bureau of technique, a better business bureau, and an information bureau, each with its separate chairman. The chairmen of these bureaus and one section member chosen at large were with the section chairman, vice-chairman and secretary constituted the executive committee. Members of the various bureaus were chosen because of their particular interest in certain lines of work. Bureaus have held meetings at the call of their own chairmen, and the chairmen in turn have reported activities to the executive committee. The personnel under this organization plan is as follows:

OFFICERS

Al. C. Joy, chairman — C. H. Peirson, vice-chairman
F. S. Myrtle, secretary

Additional members executive committee:
B. S. Allen — J. F. Pollard — G. C. Tenney — A. M. Frost

BUREAU OF TECHNIQUE

B. S. Allen, chairman

Newspaper Advertising
S. W. Green

Direct by Mail Advertising
J. C. Jordan

Illustrations and Moving Pictures
G. C. Tenney

News
C. H. Peirson

Internal Publications
F. S. Myrtle

BETTER BUSINESS BUREAU

J. F. Pollard, chairman

Cooperative Methods

M. W. Scanlon — J. C. Hobrecht — J. C. Jordan — A. H. Nicoll
A. G. Jones — R. H. Weisbrod — V. W. Hartley — J. U. Berry

Standards

F. Z. Stone — R. E. Smith — Carl Burgess
A. E. Holloway — D. L. Scott

INFORMATION BUREAU

G. C. Tenney, chairman
All members of the Section.

Code of Ethics Established

The committee on standards, following the example of a similar committee of the Public Utility Advertising Association, affiliated with the Associated Advertising Clubs of the World, has prepared a code of ethics which was unanimously adopted at the Publicity Section's meeting on Jan. 31. This code of ethics is as follows:

Our obligations and responsibilities being those of the expositor and interpreter of facts, full understanding of which by the public should benefit the public, the publisher acting as intermediary, and the industry:

We pledge ourselves to consider paramount the interest of the public, which in the larger sense includes that of the industry.

To promise rather less than more than the performance will justify.

To make clean statements only, clear, direct and fair alike to customers and competitors.

To establish confidence, through every contact, by deserving confidence.

To buy advertising service on the basis of established, tangible values only.

To furnish to publishers, by request or arrangement, authoritative information concerning the industry and its activities.

Value of Advertising Media

Much of the discussion at the section meetings was concerned with the value of different types of advertising media. Heads of advertising departments are continually solicited to take space in publications of little or no value whatever to the advertiser, the taking of such space being liittle more than a contribution and frequently making such inroads on the budget as to handicap legitimate advertising effort. Consensus of opinion was that advertising, as far as periodicals are concerned, should be confined as nearly as possible to legitimate newspapers and to their regular editions only. So-called special editions, issued on any pretext and often with no apparent excuse, are usually mere money-making schemes and serve no legitimate advertising purpose.

On recommendation of the committee on standards the following resolution was adopted:

"Resolved, That member companies as a general policy do not patronize advertising schemes, programs, etc.

"That, as a matter of general policy, no exploitation editions of newspapers or periodicals be patronized.

"That other special editions be avoided excepting as their advertising value is demonstrated."

It is realized by the Publicity and Advertising Section that hard and fast rules governing such matters cannot be made in the face of long established custom. On the other hand, recognizing the waste of time, effort, and money going into certain types of advertising, the handicap which such advertising presents to our own efforts, and the duty devolving upon us to see that our appropriations are wisely spent, we believe this resolution marks a step in the right direction and that in the course of time all excepting legitimate forms of advertising will be eliminated.

Statistics to Be Assembled

In our plan of organization we have laid the foundation for an information bureau. Here it is proposed that statistics concerning member companies and the industry in general shall be assembled, together with reports on advertising and publicity effort, photographs, etc. Our thanks are due the Journal of Electricity for offering to act as the central agency of this bureau. All information is to be carefully filed, indexed, and made readily accessible to all members of the Association.

Discussions at our meetings have been informal, but have served as the basis for certain papers being prepared by members of this section for publication in the Journal of Electricity's pre-convention issue.

The section has presented to the executive committee of the Pacific Coast Electrical Association and to the National Electric Light Association an offer of all possible assistance in the publicity work of the forthcoming national convention. It has also discussed with Frederick S. Myrtle, chairman of the national convention's publicity committee, ways and means of assisting in his work, and the members of his special committee have been chosen from the ranks of this section.

It is the hope of this section that closer contact may be established with the Public Utilities Advertising Association of the Associated Advertising Clubs of the World. The organization is to conduct one of the important departments at the Advertising Clubs convention at Houston, Texas, in May. The appropriation allocated by the Pacific Coast Electrical Association to this section provides for the section's chairman to attend this convention.

Comparative Values of Advertising and Publicity

By FREDERICK S. MYRTLE

IN a paper presented to the Publicity Section at Coronado last year I discussed at some length the much discussed problem of newspaper advertising for the electrical industry, treating that problem from the standpoint of the public utility, only, as it presents a point of view entirely different from that of the manufacturer or dealer. I assumed then, as now, that the electrical public utility under discussion was not engaged in the business of merchandising appliances, so that the real question to be decided concerned the advisability, not to say necessity, of an advertising appropriation for a public utility having little else than service to advertise.

I maintained at that time, and I think the members of the section agreed with me, that the purpose of public utility advertising is to get people to think about the public utility and think rightly, so that, being interested, they may be informed, and being informed, may judge fairly and correctly when called upon to decide some political or economic problem in which the public utility is vitally concerned. Public utility advertising, therefore, is largely educational. It has been called institutional. It directs the attention of the public to the many problems which the public utility is called upon to solve in order to give the best possible service to its consumers at the most reasonable price to allow a fair return upon its investment. The scope of that field is not small. It may include anything and everything that concerns the operation of a public utility in its relation to the public it serves. It may deal with the physical problems of construction as well as of operation; it may take the readers of its advertisements upon an illustrated tour of the company's properties; it may call striking attention to improvements and betterments of service for the benefit of a particular community where increasing population and agricultural or industrial activity threaten to tax the utility beyond its present available resources for the supply of the commodity needed; it may seek to establish relations of intimacy with the consuming public through the personality of local managers and others engaged in representing the utility in its contact with that public. This last has been called personnel advertising.

In all of these classes of advertising it is next to impossible to measure results with accuracy. They are an "intangible something," so to speak. Nevertheless in the general analysis the public utility has been brought to realize that such advertising is profitable. I desire to repeat here what I said upon this point last year, namely: "It is a good deal like a patient ordered to follo wa vegetable diet. It is impossible for either him or his doctor to measure in drams or scruples, in heart action or blood pressure, the exact percentage of benefit to his system derived from the assimilation of any particular item on his dietetic schedule. Yet by his general improvement the patient is made to know that he is being benefited by the course of treatment."

It is a significant fact that even monopolies have found it worth while to enter the advertising field. The telephone company is a notable example. It is felt that the public has a right to know all it wants to know about the public utility whose service it purchases; what it consists of, how it is run, tracing back, if need be, that service to the point of origin and following its course, step by step, to the point of distribution. Any thinking man will realize that if the public once can be induced to take an interest in the inner workings of any public utility operating in its midst an important poinnt is scored for the utility. It is safe to say that nearly one hundred per cent of the misunderstandings that arise from time to time between the public utility and the public are due to sheer ignorance on the part of the public of what is involved in the services for which the public pays.

The point is made, then, that in this twentieth century age of progress and development the advisability of a public utility entering the advertising field cannot be questioned. There is always question, however, as to what particular form of advertising secures the best results. In an attempt to solve this question I shall suggest that the form of advertising which appeals most to the public and, therefore, should be calculated to insure the best results, is that through which the public utility aims to take the public to its heart, into its confidence. The average reader likes this form of address. He does not care to be bombarded with either statements or statistics; he likes to be led rather than driven; his general attitude, due largely to a time-old distrust of the public service, is inclined to be Missourian; but, as a rule, he is willing to be shown if first he can be made to believe that his confidence, and not his credulity, is sought to be engaged.

The particular public utility with which I have the honor to be associated has conducted a diversified advertising campaign for a number of years and, as far as we are able to judge, with excellent results. Newspapers have been practically the sole advertising medium, but the advertising has been divided into classes according to the purpose sought to be accomplished, a series of educational or institutional advertisements being followed by a series intended to increase sales of the commodities manufactured and distributed by the utility. Our advertising department reports favorable reaction from its campaigns generally, so that it is not easy to pick out any particular kind of advertisement as possessing more popular appeal than another. However, it is the opinion of the department that there are three types of advertisement that appear to elicit the most favorable comment. These are:

First, advertisements which call public attention to local conditions through local mediums of advertising, showing progress and development and the activities prosecuted by the utility in keeping pace with and encouraging such progress and development by specific extensions and improvements of service.

Second, those advertisements which explain, as simply and as lucidly as possible, the intelligent use of the particular commodity for sale; in other words, telling the consumer how to help himself through that intelligent use. The main idea in this form of advertisement is to convince the public that economical use of a commodity brings satisfaction to the consumer, and it is better to have satisfied consumers than extravagant bills for consumption.

Third, the personnel advertisement. Under this head our company instituted a scheme of advertising whereby it introduced to its consumers in various sections of the territory covered by its operations a few of the local men of the company whose business it was to serve them in various capacities. In so doing our company endeavored to bring the point of contact closer, to establish as far as possible a get-together spirit between the public utility and the residents of each community covered by its operations. This class of advertising awakened considerable public interest in the various territorial divisions of the company's operating field.

Not all the utilities, however, resort to newspaper advertising. Some affect billboards; others believe in circularization as having a more direct appeal to the consumer. Slides in motion picture theaters, placards in company offices, and a dozen other methods of stimulating public interest present themselves from time to time.

One particular form of advertising has not been included in those so far discussed for the reason that, unlike the others, it has a direct selling interest and its results are susceptible of more or less accurate measurement. I refer to what is called financial advertising, that is to say, advertising undertaken in connection with a stock or bond-selling campaign. It is known generally that, following the precedent established nearly eleven years ago on the Pacific Coast, most of the utilities now are selling stock over the counter to stockholders, consumers, employees and the general public. In connection with a campaign of that sort it is needless to say that a liberal yet discriminating use of printer's ink is almost indispensable to success.

One of the most desirable things in financial advertising, and one of the most difficult, is the ability to strike a happy medium between advertising designed primarily to attract the eye of the reader and those bristling with financial statistics. The advertiser in this respect must adapt himself to some extent to the character of the medium which he intends to utilize. An advertisement in the "Commercial and Financial Chronicle" or "Wall Street Journal," for example, which circulate almost exclusively among men with more or less financial experience, may be expected to contain little but short statements of fact and pertinent statistics without any "window dressing." On the other hand, advertisements designed for insertion in newspapers having a general circulation should not be overburdened with detailed earnings statements, balance sheets, or other matters of a technical nature.

Following are some of the things concerning which the prospective investor may naturally be assumed to desire information before purchasing a security:

The business in which the company is engaged.

Its growth over a period of years, as reflected by the increase in customers, volume of sales, etc.

The character of the territory in which the company operates, as indicating the possibilities of future development.

The company's past and present earning capacity.

Its present financial position as indicated by the excess of current assets over current liabilities, and particularly its cash working capital.

The property values which its securities represent.

The market for the security and its acceptability by banks as collateral for loans.

The price of the security and the terms upon which it may be purchased.

The rate of dividends and dates of payments.

There are, of course, a good many other points which may suggest themselves. The foregoing are merely some of fundamentals, and advertisements can be designed with advantage to cover, either in a single display or a series of insertions, all of these features.

It must be recognized that a very considerable number of people are not trained sufficiently in financial matters to pick the essential facts out of an earnings statement or to dissect a balance sheet, and the appeal to this class of readers perhaps can be based largely on generalities. Some companies, for example, have secured a considerable measure of success through advertisements emphasizing the value of thrift and the advantages of steady saving, or stressing particularly the unusual degree of safety afforded by public utility investments. As a rule, however, it may be said that generalities, however attractively presented, are not what is desired by the experienced investor. He wants actual facts about the security.

On the general subject of financial advertising it may be stated that a successful campaign for the direct sale of securities involves:

(1) The preparation of advertisements designed to convey in a convincing and easily understandable manner the merits of the issue offered.

(2) An intelligent selection of the most appropriate mediums for the insertion of the various types of advertisements which may be utilized.

So much for newspaper advertising as a means of direct publicity. Wiith that goes what may be called indirect publicity, a most desirable supplement to the other and possessing the added merit of insertion without cost. Newspapers are always willing to print items possessing legitimate news value, such as recent statements of earnings, stories of business development, articles on construction activities, and the like, and the public utilities through this means may secure much valuable publicity which is of interest not only to holders and prospective purchasers of their securities, but also to the general public as consumers. The fact that the newspapers have come to regard the major operations of public utilities as having a definite news value is evidenced by the tremendous increase in recent years in the volume of news publicity as measured by column inches of printed matter.

House Organs—Internal and External

By W. A. CYR

LIKE some specious prescriptions of "rubbing alcohol," house publications of public service companies are used externally as well as internally. Therefore, like Julius Caesar's Gaul, so-called, internal publications may be divided into two varieties—internal and external. A sort of hybrid of the two forms a third.

Internal Publication

Since charity and house organs begin at home, the primary house organ is for strictly Narcissine use, to hold a mirror up to its own face. In other words, the purely internal type is to sell the company to its human components.

No company organization is so united, despite the best internal relations, that no need exists for better knowledge of the company by all of its many individual members. Old timers may be wholly and blindly loyal to a company that for years has treated them fairly; but no company is standing still. It needs new blood as it needs new poles, lines, and meters to augment growing service. And these recruits, coming from the nowhere into the here, must be given in as short time as possible, the ideals, the respect for, and the desire to be loyal to the company that grows into old-timers from long association.

The internal publication, edited in simple and human fashion, seeks to accomplish this task, carrying the ideals of management in understandable terms to the lowliest mucker or ditch digger. In turn it acts as emissary to the management for the man who sets meters or pulls cable, telling his ideals and aspirations, his loyalty and painstaking service.

These strictly internal publications, with circulation limited to the employees themselves, are divided again into two classes.

There are papers like the P.S.E.A. "News" of the Pacific Gas and Electric Company, edited by the employees' organization. These publications abound in personal items about employees, printing their contributions with as little editing as the law allows, their poems, their children's pictures, and accounts of their outings and activities. It is a little country newspaper within the organization. Although of very little interest outside the organization family circle, it is perhaps the most appreciated type of publication issued

internally—as far as the effect on the personnel is concerned.

The other type is that put out by the management "on behalf of the employees." It is designed for the employee with an eye to the outsider under whose gaze it may fall. While ostensibly an internal publication, it may be compared to the school teacher when the inspector is present. This type of magazine is more on its good behavior. It has its sections devoted to employees' gossip; but the gossip is touched up where mother tongue has been weak. And generally, as in my own company's magazine, "Glow," of the San Diego Consolidated Gas & Electric Company, it devotes several pages to illustrated articles on company methods, properties, departmental functions, ideals, and aspirations. It is, in short, more a magazine and less a newspaper. It seeks to be instructive as well as entertaining, dignified as well as human.

External Publications

External publications also have dual personality. There is first, the quasi-external publication, such as issued by Western States Gas & Electric Company, Coast Valleys Gas & Electric Company, and others, a brief leaflet issued quarterly by the stockholders accompanying their dividend check. It aims to give in brief a review of the construction or expansion features of company activity, the state of its finances, and a caution or two as to the danger of letting go of good paying public utility stock in trade for "wild cats."

Other companies have extended these boundaries, notably the "Pacific Service Magazine," published by the Pacific Gas and Electric Company. This excellent magazine is published to sell the achievements, service and ideals of its company to its vast army of shareholders and to the influential forces of the community. While it is circulated to employees as well, it is designed primarily for external consumption.

Feature articles, well illustrated, written by authorities within the company, editorials of a high tone, and generally well edited and prepared copy may be used. The purpose is at once to impress and to influence toward building substantial good will. It is to give the reader a feeling for the soundness of the public-service institution and a respect for its high purposes.

Another type of external publication, the most ambitious and successful of which is to be found in "P.G.& E. Progress," is essentially for public consumption, truly a newspaper edited by the company on behalf of its customers. It found its beginnings in the small leaflet sent out with monthly bills, still in vogue in many companies. Its contents are helpful and instructive, its columns devoted to the better use of electricity and appliances. Economies which appeal to every housewife, recipes for cooking, and methods of doing housework electrically are featured. It carries also constructive articles on company methods and policies, tells how to read meters, apply for service, give notification of moving—all considerations which mutually benefit customer and company.

Excerpts from editorial opinions regarding public policy, municipal or government ownership, and other phases of activity are carried in its pages. New construction is detailed, plans for improvement discussed, public movements of merit are fostered. In effect, it is a truly community journal—serving that community which is the company's territory.

Internal-External Publications

And now for the hybrid. It is that type of internal publication at once internal and external, the best exemple of which is "San Joaquin Power" of the San Joaquin Light & Power Corporation. In this type of magazine are combined the attractive features of each distinct type, blended in proportion according to their value, the whole well seasoned with good judgment and dished up in attractive style. This type of magazine attempts the seemingly impossible task of reaching out one hand to the employees, another to the public, and a spare hand to the stockholders.

There is a definite section for the frivolities and personalities of the employee. There are sections devoted to interests of company and stockholder alike. And there are articles and features for the general public, showing the development of the community served by the company and, modestly, the part played by electricity, the master servant. The latter type of publication, seeking to cover so wide a field, requires much more tactful and versatile treatment editorially, but in many respects presents distinct advantages of economy.

Few doubt the value of house publications—no matter how modest circumstances require them to be. Rather it is "what type of publication" that is the question. It is well in such case to survey the field and select that type most urgently required, following, as circumstances warrant, with the other types, or else with gaining experience, essay by degrees the merger of them all in one, the internal-external "hybrid."

Who Shall Pay for Dealer Helps?

By M. W. SCANLON

DEALER helps, so called, include all such items as folders, window and counter displays, novelties, advertising cuts, street car cards, lantern slides, truck signs, calendars, mailing pieces, and outdoor posters. Price cards and catalogs hardly can be included in this list. Dealer helps are only such material as is circulated by dealers in retail selling effort. They are an economical aid to retail selling and therefore necessary.

Such material is subject to the wasteful or the saving element in the personal equation of each dealer to whom it is supplied. This is more likely to be a saving element if the dealer has a real financial investment in the material and realizes it. Even when a dealer has an actual money investment at stake, he often will follow least resistance and allow inefficient use of the material rather than spend the time and energy necessary to get the greatest benefit from it. Naturally this tendency is greater where no investment is involved.

Dealer helps are practically out of the question unless they can be produced on a large scale. The cost of quantities ordinarily sufficient for the demands of an individual dealer would be exorbitant. It is necessary, then, that they be financed and produced by some central agency.

If left to cooperative associations, the cost of the material is borne by the membership, which automatically answers the question, "Who shall pay?" Dealer helps produced by associations must be neutral in their appeals. This places them on a footing with the salesman who offers to sell a customer "any kind of an iron you want" without regard to comparative quality, durability, or efficiency. The salesman in this case has an opportunity to show several irons, but the cooperative dealer help is limited to noncommittal illustration and discussion. Consequently the burden of financing and producing dealer helps has fallen upon the manufacturers who have a definite prospect-satisfying and sales-making story to tell. And because dealer helps prepared by a manufacturer tell the story of that manufacturer's particular line, dealers are often inclined to ask offendedly why they should be expected to bear the advertising bills of "So-and-So Electrical Manufacturing Company."

A statement of the several functions in the process of placing the product in the consumer's hands may be put this way:

Manufacturer makes the goods.
Manufacturer stocks the goods centrally.
Manufacturer sells the goods to jobber.
Jobber stocks the goods sub-centrally.
Jobber sells the goods to dealer.
Dealer stocks the goods locally.
Dealer sells the goods to consumer.
Dealer installs and services the goods sold.

Each of these operations is an easily defined expense item. If any one of the three members of this chain offers to do any part of another member's work, a transfer of expense is involved and the second member profits.

Dealer helps are definitely an adjunct to the selling of goods to the consumer. But since it is uneconomical for individual dealers to produce their own folders, displays, etc., the situation requires that the manufacturer produce the dealer helps. This still constitutes an acceptance by the manufacturer of a portion of the normal function of the dealer, a favor from manufacturer to dealer.

Two principal reasons exist for the cost of dealer helps being placed on the dealer:

1. More careful and efficient use is made of material in which the dealer has his own money invested.

2. Dealer helps, being a retailing accessory, should be paid for by the one to whom retail profits accrue.

But logical conclusions also must cover the psychological considerations in selling. If dealers ever pay for all their folders and displays, it will be only as the result of a tremendously successful job of selling. They have become so accustomed to being supplied lavishly with dealer helps of all kinds that many of them have come to expect such helps as a divine right. They are willing to pay for the occasional display or novelty, but it is an expensive undertaking to sell them any large proportion of what they receive at anything like actual cost prices.

The experience of this company in selling the window display services and the illustrated letterheads is sufficient evidence of this obstacle. The actual cost of securing such window display service contracts as we have now in the San Francisco office is so exorbitant that there is little possibility of our realizing enough additional business to balance the account. For example: one of our merchandising salesmen working his territory was accompanied by a publicity division man for a week, and both talked the window display service to every dealer on whom they called. On the trip four displays were placed. Possibly one man could have done as well alone, if he had both the outside man's knowledge of the trade and the inside man's knowledge of the displays. Even so, the average would have been a display for each day and a half per man, and the cost per sale aside from cost of production, warehousing, and transportation would have been close to twenty dollars. Yet this seems to be the only way these displays can be sold.

The dealer believes sincerely that the manufacturer should provide for him, free of all cost, all the dealer helps he can use. In spite of this obstacle, it seems absolutely necessary that the dealer be called on to bear a portion of this expense, because the demand for this material is increasing to the point where its cost has become an extremely important item, and it is not infrequently that we receive requests for dealer helps worth ten to twenty per cent of the business that we expect to result. It takes only 200 folders of the black and white half-cent variety to eat up five per cent of the gross retail sales value of four $5 irons. The average electrical dealer spends less than two per cent of his gross sales in advertising locally for himself.

Probably the best we can ask is that the dealer accept a part of the cost of dealer helps. This secures from him a more vital interest because of financial interest, avoids partly the expensive operation of selling him something he believes should be given him, and at the same time gives the manufacturer a measure of much deserved relief. This sharing of expense should not be based on certain items but should be on a set basis for all items in order to be fully effective.

Reaching the Stockholder

By CHARLES HESTON PEIRSON

IN a modern sales organization, in which publicity, advertising and salesmanship are woven together for a particular purpose, it is impossible and futile to attempt to separate the strands. In discussing the subject of stock sales or "reaching the stockholder," from the standpoint of the publicitiy manager the existence of a permanent, efficient and agressive sales organization must be recognized as fundamental. Were it not so, it is doubtful if the most active efforts in publicity and advertising would be perceptibly efficient in selling conservative securities, of the non-speculative and non-spectacular class. In this conservative class are the public utilities of California and the United States, and the placing of their securities in the market involves a thoughtful transaction between the seller and buyer. In almost every instance they are culminated by experienced salesmen or the ordinary employee of the utility who has had some training in selling the company's stock to its consumers.

Having only a superficial knowledge of the stock-selling methods of other California utilities, I must confine this discussion largely to the activities of the Southern California Edison Company in placing its junior securities in the hands of the public, and of this public its consumers and patrons are the dominating element.

Historically, the story of the company's experience in the sale of its common and preferred stock runs substantially as follows: When in July, 1917, the Southern California Edison Company adopted the policy of selling its junior securities to its patrons and the public, it had approximately 2,000 stockholders, nearly all of whom resided in the East. The campaign of advertising and salesmanship scarcely had been organized when war necessity required the government to float enormous issues of Liberty Loan bonds. Actuated by patriotic motives, the company, like nearly all of the "hundred-percent" American organizations of its class, retired from active competition with the United States Treasury. It seemed manifestly unfair to push the sale of securities bearing a normal rate of interest against the securities of the United States Treasury, the proceeds of which were essential to the prosecution of the war. Thus it transpired that until after the armistice the company practically retired from all active stock selling, swinging the volunteer services of its organization and donating large volumes of advertising space that had been arranged for to the sale of Liberty Loan bonds. In the years of adjustment following the war money was in great demand for rehabilitation, and conditions were generally adverse to the marketing of securities. It thus resulted that from the year 1917 to the beginning of 1921 the company had secured only 4,000 additional stockholders, or a total of 6,000.

With the return of normal conditions, and with a seasoned organization of salesmen and a publicity program that functioned from the city to the smallest hamlet, the company began its actual stock-selling activities, adding 18,000 new stockholders, most of whom were consumers, and ended the year Jan. 1, 1921, with a total of 24,000 individual stockholders.

In 1922 this number was raised to 48,000 stockholders; in 1923 to 64,000 stockholders; and the year 1924 closed with 70,103 individual stockholders, of whom at least 90 per cent are consumers of the company's electric product, either by direct meter connection, or through the medium of some of the organizations that purchase current at wholesale and distribute it to the consumer. Since 1917 the total sales of junior securities have amounted to over $60,000,000.

While over 70,000 stockholders out of approximately half a million meters supplied by the company's electric product either at retail or wholesale seems quite an encouraging start, the company regards it as only a start. Theoretically it is assumed that every consumer should be a participating partner in the electric utility that serves him. The ideal public utility of the future is the one in which every consumer is a partner-stockholder.

While anything approaching saturation of stock sales is in the very remote future, this utility is continually endeavoring by more intensive and analytical study based on eight years experience to keep the volume of sales on the increase as well as to keep the sale cost down.

Fitting very closely into the methods which it is adopting is the long established plan of purchasing advertising space in annual blocks that can be consumed in such quantities and at such times as its use is most advantageous and keeping so far as possible away from "rate holders," standing ads or any of the forms of contract which compel the use of advertising when and where its value is negligible. In central and southern California, as well as in other parts of the state, there is a very great diversity of cropping seasons which have a most important bearing on stock sales. In a community where all the money is being used to grow a crop, there is little available for investment. When the harvest is over and its proceeds come home, the harvest money seeks investment. The company's security manager has worked out a few successful studies in alternating activities which seem to justify further and more comprehensive analysis. He maintains in the field what he calls the "flying squadron" of salesmen. The company is working on the amplification of this system by making its stock sales advertising conform in a large degree and be coincident to the activities of this flying squadron.

The phases of this alternation of activities which the sales manager has inaugurated can be illustrated by these three examples:

During April, May and June in the foothill regions of southern California he finds that money is normally plentiful and stock sales good, because it is at this season that the proceeds from Valencia oranges and other citrus fruits have returned to the community and are awaiting investment. During September, October and November the money from the harvest of grains, raisins and deciduous fruits is coming back to the growers of Tulare and Kings counties. In January and July the semi-annual interest on bonds is being paid, and consequently there is a surplus for investment in Los Angeles and the large residential cities of southern California.

By working his flying squadron and centering his sales activities at the centers where money is, so to speak, at leisure, far better sales results are obtained than would be possible in the territory where capital is engaged in the requirements of production.

It naturally follows that shifting large space advertising to stimulate the activities of the stock sales department to conform to the prospect-peaks in the rotation of the season's advertising has a much stronger pulling power than it would have if dribbled out in the communities where all the money of the people is in demand for the conduct of their own affairs. Such studies as this lead the company to believe that, as it reaches conclusions from exact analysis and bases its activities on proven data, it will continue to reach more and more of its consumers, and that each year will increase the number of customer-owners.

At this writing the securities manager, the advertising manager, and the publicity manager are collaborating in the preparation of a set of district charts which they believe will enable the general manager to see at a glance what has been accomplished in each of the thirty-one geographic districts in which the Edison territory is divided and enable him to determine with considerable exactness the field in which activities can be directed most advantageously.

It is proposed that each of these district charts shall show the district population; the number of meter connections; the total circulation of newspapers within the district, and so far as possible the financial status of the district and the number of company stockholders. Each of these statistical groups is to be worked out in percentages, each as relating to the other. For instance, the total newspaper circulation shown in its ratio to the number of stockholders would enable the publicity manager and the advertising manager to reach valuable conclusions as to the relative drawing power of newspaper advertising in each of the thirty-one districts. Naturally this knowledge will be a valuable guide in making up the annual advertising appropriation and will show where it is profitable to increase the amount of advertising. Efforts are being made to substitute exact knowledge for generalities and chance conclusions. From the very outset it has been the plan to meet advertising constructively. Its dominating note has always been "be a partner in the utility which provides your electric service," or "let your power stock dividends pay your power bills." The company always is striving to get away from the catch phrase, the "solving sentence," the platitude, and the slogan which advertising adventurers have worn threadbare, and to substitute constructive ideas which will stimulate constructive thought and cause the reader to apply the great principle of customer-ownership to his home and his business.

The preparation of advertising copy for a public utility company requires a deeper and greater range of economic thought than in the arrangement of announcements for ordinary commercial purposes. It is truly one of these occupations in which the more work you put into it, the more results you take out.

The writer is frequently asked these questions: "What effect has publicity on stock sales?" "What effect has stock sales on publicity?"

To the first question the most definite answer that I can make is to quote the investment manager who says, "It is only once in a blue moon that one of my salesmen has to sell the Southern California Edison Company to a stock prospect." Publicity and advertising has informed the public so thoroughly and saturated the community regarding the company, its projects and its service, that the salesman's task is very largely confined to a strictly business transaction. It is very much the kind of a transaction that would take place between a salesman and a customer who is deciding upon the purchase of a standard article.

It is the salesman, however, who in the majority of clases, closes all security transactions. It is only in rare instances that the company is able to trace any such results from advertising as would occur with a mail order house.

Of course, there are freak exceptions. Several years ago when the advertising campaign was spread out so that the smallest weekly paper in the Edison territory should have its proportionate share of business as based on its circulation, the company placed one or two exclusive advertisements in a small weekly paper with about three hundred subscribers. Within a little over a fortnight the district manager in this district sold something over $30,000 worth of stock over his counter. This result was so unusual that I gave it personal investigation, and the answer was simple. This litile paper was circulated by rural free delivery among ranchers in a rich and highly productive agricultural community in which probably very few city papers were read. These prosperous ranchers had money at interest on low rate investments and, as they were practically all patrons and consumers of the Edison company, they had confidence in it. Seeing the announcement of junior securities at a better rate of interest than their money was returning to them, they went unsolicited to the nearest Edison office and became partner-stockholders in the utility which provided the electricity for their ranches. While such instances as this should never be taken as a guide for general advertising campaigns, it illustrates very forcefully the selling power of the advertising columns in the smallest legitimate newspaper, and emphasizes very emphatically that a field is most imperfectly covered when the advertising department depends on metropolitan or class papers to blanket a large domain.

The effect that stock sales have on publicity is a most interesting phase of this company's activities. The one hundred and seventy odd newspapers published in this territory are the medium through which the company is in constant communication with its stockholders. Edison stockholders are as numerous among their subscribers as the stockholders in their mutual irrigation companies; their citrus association, of their walnut growers' association, and consequently Edison news ceases to be regarded as a foreign activity, but becomes intensively local because it has a personal and vital interest to the editor's own constituency. It is my belief that as customer-ownership increases, and the publishers of the state come to understand that public-utility stockholders represent larger and larger blocks of their readers, the necessity for company publications and circulation will decrease.

Big construction projects are naturally of state-wide interest and are sometimes world news. The stockholder of the company which is engaged in these projects expects to see their progress related in his local paper. But big construction projects, in fact construction work of sufficient importance to become news, are too much like "angels' visits" to be relied upon as a constant source of news. Stock sales and financial activities, on the other hand, are so constant that they can be reduced to a news routine.

The annual budget is always the subject of a feature story. A month or two later the budget appropriation is split into the appropriations for construction and betterment in each of the thirty-one districts, making each an individual local story. An appropriation of several hundred thousand is as good a story for a small town as a new courthouse, and these "split budget" stories usually carry a seven or eight column banner-line head. Then there is the annual meeting of stockholders which, if properly localized, interests as many Edison stockholders in each town as would be interested in the meeting of the citrus association. Four good local stories are always available based on the payment of quarterly stock dividends. The company has so many stockholders in these small towns that the arrival of dividend checks is of interest to the banker and the merchant, as well as to the stockholders who receive them. Sometimes these are worked out so as to show just how much Edison dividend money will reach a town on a certain day. It is found that these little quarterly stories have about the best psychological effect of any that are sent out. They show the people of the community that the corporation is not engaged solely in taking money out of the town in the form of

light bills, but returning money to the consumer in dividend checks. These regular payments of dividends to Edison stockholders likewise have a tendency to create more Edison stockholders and to discourage people who put money into wildcat schemes that usually return assessments instead of dividends.

Speaking from the viewpoint of a publicity man, each day of a long life which has been exclusively devoted to writing and dissemination of the printed word adds to my belief that publicity is the great dominating medium by which the people en masse can be enlisted in the public ownership of utilities which serve them, in the cooperative movement in which we are all engaged, and cooperation is the antidote for anarchy.

Permit me to emphasize and underscore **dissemination and distribution of publicity**, for that impresses me as the great problem of publicity. Distribution is to publicity exactly what transmission is to electricity and what transportation is to commerce. Without a practical distribution system the best publicity mill that ever ground out copy is a power house without a distribution system.

Not a week passes by but some applicant, young or old, with a fine store of qualifications strikes me for a job to write publicity. They all want to sit at a desk and be generators and let someone else peddle their product. I have yet to find the first one who desires to buckle on the gaffs and go out and shin up a single new pole which will add to the distribution of publicity. I could go into a broadcasting station tonight and whistle into the microphone and fill every desk in the Edison office tomorrow morning with writers who in a week could paper the walls in every newspaper office in California with fairly good copy—but who would print it?

In eighteen years of corporation publicity work I have not found a single man with a single constructive idea which would work out as a practical invention for increasing the volume of constructive publicity, and for disseminating it through the twenty-five million dollars worth of newspaper properties and their circulation organizations which now exist within the state of California.

The impossibility, and the futility of any individual, or group effort to carry a message once or twice a month to the millions of people in this territory seems to me more and more apparent, as I squirm my way through the throngs and traffic of the great cities and ride the long road that stretches among isolated ranches from San Francisco to San Diego.

A regiment of orators talking six nights a week and twice on Sunday could not assemble this vast audience in groups of two hundred, and address them in fifty years. But this multitude of five or six million readers reads some one of the five hundred newspapers published in California once a day or once a week. If these papers, with their perfectly organized systems of circulation and distribution, carry our message of cooperative endeavor, "Prosper and help prosper;" "Live and let live," to their millions of readers, we shall have reached the stockholder, and the stockholder is the unit of state development and of community and national prosperity.

Public Relations from the Domestic Angle

By BEN S. ALLEN

THE family is the foundation of every worth-while institution developed by our present form of civilization. This is true of commercial as well as civic affairs and is not likely to be questioned by any serious student of industrial problems.

When master and man worked together in small industrial units they practiced, whether consciously or not, the same give-and-take found necessary in their more intimate family relations. As industry became more complex the trade and factory guilds began to take the place of the smaller units, but always paid due regard to the precious self-respect of both master and man.

The rift between the two began when Watts on one of the most momentous occasions in the history of the world saw the tremendous significance of the lifting of the lid by the steam in a tea kettle. The rift thus opened with the dawn of the machine age and steadily widened until it reached the dimensions of a chasm. This chasm has been the depositary of a huge mass of human wastage and suffering in the intervening centuries. Some of the finest minds of civilization have attempted to bridge the chasm between social and economic values with but little success until almost the dawn of the present century.

Yet a simple formula has always existed for the solution of a problem which has prevented modern civilization from becoming the fine flower of all civilizations. Nearly two thousand years ago it was preached from a Mount by the Master Economist of history. That formula has many variations from sacrifice to service, but always it implies the glory of individualism and the upholding of the self-respect of the human animal.

Master and man in the early days of small industrial units and trade guilds were terms of the same significance as parent and child, but in the machine age they took on the hardness of the material in which master and man worked. The terms connoted domination and subservience.

The fault lay in a wrong attitude towards the purpose of industry which was vividly defined when James Harvey Robinson wrote that the evils of the machine age began when men started to make chairs not to sit in but for profit.

The initial misconception began with the master, but it was not long before the man adapted the same impulse to his own necessities, and, needless to say, joined battle on a ground so narrow that neither side could fight thereon without disaster to both. But they have fought, and civilization for two centuries has been the victim of the most senseless warfare ever waged; a war which undoubtedly has done more to retard progress of civiiization than all of the wars of nations since international boundaries first were laid down.

A distinguished Englishman once said that the chief glory of America lay in the fact that the unendowed individual was given more chance of attaining distinction through his own efforts in this country than in any other nation of our own or former ages, and he expressed the opinion that for this reason alone our country had justified itself above all others. That was a proud tribute and one which we should cherish.

In this industrial age our greatest problem is the keeping alive of this precious individualism while subordinating it to the necessities of a complex industrial order. That is being done, and it is the proud boast of the public utility corporations that they have taken the lead in the effort to bridge the chasm between social and economic values. The bridgeheads on both sides are in place, and they are solidly built on piers of service.

Service is the modern economic application of the Sermon on the Mount. There is nothing mysterious about it, but the sound application of that little word is accomplishing wonders, making it appear almost miraculous.

Not so long ago the advocate of international peace exposed himself to ridicule, contumely and frequently to actual persecution. Today it is respectable to be a peace advocate. Similar was the experience of the pioneers in industrial reform who held that industrial warfare is even more insane than international hostilities.

It is a far cry in progress but not in time from the period when a utility perforce must justify itself apologetically as a servant of the public to the day when Samuel Insull, a great utility executive, could make the following forthright statement:

"I would like to refer to the question of publicity and public relationship. . . . It is of more consequence to our properties than all the rest put together. . . . For involved in the safety of our capital, the development of our business and the premanency of our business, above everything else, is this question of public relations. . . Our first duty is to see to it that everybody in our organizations, from the man at the top to the girl at the cash window or the boy who delivers bills, are so educated in the fundamentals of our business that they will carry home to all of our customers, which means to the whole of our respective communities, this primary fact: that the recognition of the duty we owe to the public, which we serve in every household, stands in our minds alongside of our duty to the owners of the properties we manage."

In the above argument it would seem that there has been a considerable swing away from the moorings of our premises. However, it is easy to swing back, because we started with the familiy, and we are com-

ing back to the domestic relations of a utility corporation.

The term, master and man, pure enough in its origin and application, does not fit in with our conception of the individualism of American democracy, so we have adopted a better term—management and men or men and management—it does not matter which, since they cannot be separated.

The term means no departure from proven economic practices, but does very decidedly mean progress in capitalistic society. Capitalism works now as it always has worked, clumsily, but it does work and no other system yet tried has worked. Its chief weakness lies in the fact that there are not enough capitalists. "Men and management" offers a solution, for the successful application of this modern formula implies stock ownership by employees. On that foundation your structure of domestic relations will stand the most furious storms, and about it should gather your public relations. But of course stock ownership does not stand alone. It is after all only a device dependent for its ultimate security on the human factor.

Every normal human being has the creative instinct always crying for expression. Give that instinct free play, is my plea to all public relations executives, who are laying the proper foundation through their own fellow workers for the success of their efforts. Avoid the word "welfare" as you would the plague and look askance upon the professional "Lady Bountiful" of either sex. Not patronage but shoulder-to-shoulder team work should distinguish company personnel activities. Let the employee create and develop ideas. Be ready with your help, but keep alive his self-respect by insisting that he follow modern practices by using a self-starter.

I shall enter into no details inherent in the subject of public relations from the domestic angle because the technique of the job is not important.

Your work is not a science; it is an art, and because of this fact your pathway is filled with stones, and a cross may await at the end.

We public relations men always show in the red ink of our ledger account, and no engineer can plot our progress; hence the stony trail we must pursue through directors' rooms and other places where we must justify our existence. But we have always cherished a secret ambition, and I feel the time is ripe to expose it. We want to flatten a triangle into a straight line. You all are familiar with the eternal utility corporation triangle made up of stockholders, employees and the public. There is an unending dispute as to which is the most important side of this triangle. It is our job to end this dispute by merging all of the sides into one common line. That is no easy job, and in doing it I recommend to my fellow public relations directors that they adopt as their staff of consolation the most inspiring verse in the most pessimistic book of the Old Testament: "In this war there is no discharge."

Advertising Must Sell

By SYDNEY W. GREEN

IN any discussion of the technic of advertsing the subject of media is one that naturally presents itself as of first importance. Because the electric light and power company is both a local and a foreign business, the problem of media in its advertising is more involved than in strictly merchandising advertising. The element of local good will demands that all newspapers be used in the territory served regardless of the fact that the field may be covered at a lower cost by using only the larger newspaper of more general circulation.

This situation in utility advertising carries the discussion of media into the department of public relations rather than that of the technic of advertising. Newspapers, magazines, direct-by-mail, radio, motion pictures and slides each have their place in utility advertising, but their use must be determined by the public policy angle as much as by a scientific investigation of the relative merits of the media based on costs. As newspapers are the most important media in the field of utility advertising, the preparation and placing of newspaper copy is a problem that has demanded considerable study on the part of the advertising department.

Back of every advertisement must be a basic idea. Why is the advertisement being inserted? The mere use of space in bombastic praise of the service or company may result in more harm than good. The public may regard such an announcement as contribution to the newspaper, no matter how sincere the writer may have been in the preparation of the copy. There are many interesting and instructive phases of almost any utility that can be told with profit to the company. The meat of the best advertisements are simple facts that have some application to the affairs of the public. The shortest route to the interest of another is through himself—by appealing to his self-interest.

While here and there the power company has some special service to offer that may be advertised advantageously, the greater portion of utility advertisements are institutional in character. The idea back of an institutional advertisement is to leave with the reader a favorable impression of the company or service. Popular subjects that have been featured in such advertisements are difficulties and danger attending the maintenance of service, and the personnel of employees rendering service. This copy has a cash register value when tied in with an offer to render a special service or to invite the public to become partners in the business. The mere story of how a crew of linemen resumed service after a severe storm is leaving the story half told. That particular effort was made to render service which the public expects. The idea will be more forcefully driven home when the public is invited to become one of this fearless, loyal organization through the purchase of stock. When a story of courage or loyalty is told there is no reason why the manufacturer cannot be sold the idea that electrical service in his factory has the protection of loyal power company employees. The personnel of the campany may be used to sell the housewife ranges, water heaters, or better lighting. The public expects to be sold something in every advertisement and there is a feeling of disappointment left in the minds of readers who read a well written story without the reason being made obvious.

A message or series of talks from the management or chief executive may be given in newspaper display copy with reasonable certainty that it will be generally read. Most people are interested in the big men who direct or control utilities. These talks may be made very personal and human, dealing with the problems of community, thereby breaking down the "soulless corporation" resistence. Each message should carry an invitation to become one of the stockholders of the company. A shareholder is much more interested in the company whose president and manager he knows than in the "Central Power Corporation," the personnel of which he knows nothing.

All this is good copy for the country paper and should be used there because rural districts are more often the hotbeds of criticism than are the cities.

Because the utility must use a large number of newspapers, mostly small country weeklies, the advertising man is confronted with the problem of having his carefully prepared copy printed so it can be read. To trust the average country printer with the reproduction of the best reprint copy is fatal. Even with the simplest layout it is not possible to obtain any degree of accuracy in advertising so handled. This situation means that the advertisements must be sent to the printer in the form of stereotype or electrotype cuts or a mat from which a stereotype can be made.

Cold type can be made to tell a story providing the story is interesting, but one good picture is worth a thousand words. While it is difficult to secure good pictures, it is even more difficult to have them properly printed. For newspaper printing, the most satisfactory results are to be obtained from line drawings. They print well and in case mats are used the results are generally satisfactory. Not so with halftones. Of course, the best illustrations are halftones from actual photographs that tell a story. But the utility using a string of weeklies is denied this means of picture reproduction unless the budget is sufficiently large to permit the sending of original cuts or a good grade of electrotypes to the country printer. Even then the results are terrible to contemplate in most of the publications. So the safest rule is to stick to line drawings, and send the country printer mats or stereotypes.

Very ornate copy or overly artistic arrangement very often distract the attention of the reader from the subject matter. Simple arrangement with not less than 25 per cent of white space is always good. Distinctive lettering in headings is permissible provided it is

legible, but the body matter should always be the plainest and most legible of type. The average reader absorbs the thought of matter printed in plain type, well spaced, much more quickly than when printed in quaint and queer letters. This is only natural as the eye has been trained to the plain types. Other forms offer resistence to quick reading.

Summarized, the technic of good advertising is first, thought; second, illustration; third, style and arrangement; and last but not least, good printing.

Proper Handling of Obsolete Scrap Material and Equipment

Report of Committee No. 1, Purchasing and Stores Section*

THE economical handling of scrap and obsolete material is one of the most important phases in connection with public utility company operation, and a subject which demands intelligent study. We have given consideration to this subject from four different viewpoints, each we believe having an equal bearing on the final result obtained.

1. Material and equipment committee.
2. Reclamation of material and equipment.
3. Handling of obsolete material, equipment and scrap.
4. Sale of obsolete material, equipment and scrap.

Material and Equipment Committee

We recommend as a means of eliminating obsolete and scrap items from store stock, the appointment of a Material Committee composed of the general storekeeper and representatives from each department having to do with the ordering, using or selling of material. That the general storekeeper be appointed chairman of such committee, because of his more intimate knowledge of the stock. This committee should have the hearty cooperation of the executive officers and should be given sufficient authority to make their decisions as to future use or sale of material final. The duty of this committee would be to inspect each item of stock for which there is no call and to decide at that time whether it should be held for future use or sold.

When material is held owing to a difference of opinion, we would suggest the keeping of a record showing description, name of committee member dissenting, reasons for holding and date of inspection. This record should be referred back to the committee regularly for further consideration.

We also recommend that the Stores Department compile an Obsolete Material catalog covering items declared obsolete by the Material Committee, such catalog to be arranged according to classes and to be of loose leaf form so as to permit an economical revision and correction. Copies of this catalog should be furnished all storekeepers and departments engaged in the dismantling of material so that proper disposition can be made at the time of retirement, thereby avoiding duplication in accounting and inspection.

Items not covered in the catalog should be referred for examination and classification to the Material Committee at the time estimates are being made for this dismantling, (or if overlooked then at the time material is delivered to the storehouse), in order that the status of the material may be determined before the same is charged to Supply Account.

Reclamation of Material and Equipment

Reclamation of material is the recovery of money otherwise lost. It means the recovery of material unsuitable in its present condition for further use, but by intelligent expenditure can be renewed to serve its original purpose.

This committee recommends that work of reclaiming material and equipment be under the direct supervision of the Stores Department for the following reasons:

(a) Store organizations are trained for the work.

(b) Their knowledge of the materials used and the quantities necessary, enables them to determine the amount to be reclaimed, thereby preventing the reclaiming at a loss material not needed.

(c) The Stores Department is interested in the abuse as well as the use of material, and its supervision of reclaiming makes it better able to correct not only abuse in ordering, but also abuse in using.

(d) Due to the fact that a great deal of the work in connection with reclaiming can be done by unskilled labor, the Stores Department can do the work much more cheaply than any other department.

Adequate buildings and efficient equipment should be provided, and the work of reclaiming should be centralized as far as possible so that unnecessary supervision, duplication of labor organizations, and lost motion may be reduced to the minimum. The location of the reclamation plant should be handy to the scrap warehouse, as a great deal of reclaimed material comes from scrap. The foreman of the reclamation plant should be thoroughly posted in materials, their use and market prices. A very complete cost system should be installed so as to prevent reclaiming at a loss. All material reclaimed should be inspected by a competent person to see that it is in condition to meet the requirements of its use. An effort should be made to stimulate interest on the part of users of material, by acquainting them with the value in dollars and cents of material they are using, and by showing them the possible saving in investment by proper reclaiming.

Handling of Obsolete Material, Equipment and Scrap

We find that the real meaning of the word "scrap" is not fully understood by the average utility company employee. It is interpreted as something useless, without value and to be disposed of by throwing away.

We recommend first that all material known to be scrap, obsolete or for which the company has no further use, be carried in a separate account and not confused with the regular Material and Supplies stock. That users of material be advised of the importance of returning to the store everything taken from the line, regardless of its condition. Scrap metals should be segregated and classified as to kind and stores separately in bins provided for the purpose. Scrap bins should be located near loading platforms so that long hauls and duplicate handlings may be avoided. Scrap copper should be annealed and put in bales of approximately 200 lb. for convenience in handling.

All scrap accumulating on the system should be brought to one or more central locations for disposal, excepting in cases where the accumulation at plants or construction jobs is large and the sale could be effected more economically at that point. Sales of this kind should not be made however without an inspector on the ground to see that metals are properly segregated and usable material removed.

All scrap turned in should be carefully inspected so as to eliminate the possibility of junking serviceable material or material that might be reclaimed at a profit. Scrap should be cleaned up regularly and never allowed to accumulate in unsightly piles, detracting from the appearance of the company property, increasing fire hazard and delaying the use of the money its sale value represents.

In making carload shipments, cars should be loaded to the maximum, so that full advantage may be taken of freight charges. Owing to the fact that most kinds of scrap have a small market value, the use of up-to-date labor saving devices is recommended as a means of reducing costs.

Sale of Obsolete Material, Equipment and Scrap

We recommend that the sale of scrap be under supervision of the sales department, and not the stores department. One department will then act as a check on the other. No sales should be made by the sales department until released by the stores department. A very close cooperation should exist between the sales

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and store departments, so that sales may be made to the best advantage, in other words, by cooperation the seller might be able to get a better price for a piece of equipment as is, while in others the price might be more if dismantled. Scrap should be sold promptly and not held indefinitely for a possible rise in price. The profit and loss due to the rise and fall in price, will in the course of a year about equalize, therefore the advantage to be gained by frequent sales are:

1. Decreased amount of storage space necessary.
2. Reduction in labor costs in handling.
3. Elimination of shrinkage and possible loss by theft.
4. Prompt return to use of the money derived from its sale..

Stores Department Budget

Report of Committee No. 2, Purchasing and Stores Section.*

THE proper consideration of this subject should be taken up under three heads: (1) Organization of the supply department; (2) Control of the materials and supplies; and (3) Materials and Supplies budget.

Henry H. Farguhar, associate professor, Harvard Graduate School of Business Administration, in his book on "Factory Storekeeping" states:

> From a material standpoint the fundamental idea upon which war is conducted is so to organize and manage that the man at the front is enabled to keep his mind continuously on his main duty—the defeat of the enemy—without handicapping him in any way with questions of supplies of any kind. He should be able to absolutely forget material. Ideally and actually he should be able to reach his hand behind him at any time and receive exactly what he needs—no more, no less—at the moment. An over supply will impede his action, consume his time and attention, and result in waste; a deficiency either in quantity or in quality will render him helpless.

This then is the function of the supply department, and the underlying principle of material control, namely, having on hand at exactly the right time, just the right material, in the right quantity, at the lowest cost consistent with quality.

The function of the department should govern the organization. In attempting to lay out the organization any titles for the positions will be omitted, as those would necessarily vary in the different companies, according to size and other local conditions.

Responsibility should rest in a single individual, not in a number or in a committee. This indivdual should be an executve, preferably the head of this department only, although the size of the organization may preclude that. He may do the buying as well as have active charge of the storeroom; or he may supervise, handling the more important work, leaving the lesser details to minor employees and clerks; or he may be purely executive, outlining policies and supervising entirely, dividing the work under him to one or more executives.

Primarily, whatever the details, the authority and responsibility for material and supplies should be centralized in a department separate from the other departments, and the control vested absolutely in this individual.

The responsibility for what and how much is carried in stock should be his, and his word should be final—subject of course, to the revision of the general manager or board of directors. This does not mean that the construction, sales and operating departments should not make known their wants and their recommendations as to what material should be kept on hand. The head of the supply department should be a capable man of broad vision, acquainted with the company's history, plans, and finances sufficiently to cooperate thoroughly with the other department heads to the end that material may be on hand when needed, but excesses avoided. The standards and specifications would come from the other departments, and from such sources naturally would come the recommendations for what spare parts and spare units should be on hand. However the amount of the investment that easily can be piled up in the supply account, unless very carefully controlled, makes it necessary to put the burden of proving the need of adding to the supplies, upon the department desiring the same. The executive in charge of supplies should act as the check, for he, more clearly than any one else, can see from past experiences the evils of overbuying and overstoring, as well as know the humiliation of censure for not proving. The purchase cost of the article as well as the cost of storing—space, handling and insurance; the liability of deterioration; time necessary for delivery; possible substitutes already in stock; these are all matters that must be considered in connection with bringing of material into the supply account and are those with which the supply department is more familiar than other departments.

As an aid to the foregoing, and to fit in with it the Material and Supplies Budget is a necessary adjunct. "Buying by budget," says John C. Dinsmore, purchasing agent of the University of Chicago, "is nothing more or less than the careful tabulation in detail of the things that have been accomplished in the past, together with the amount that these accomplishments have cost side by side with conservative estimate of the things you expect to accomplish in the immediate future, together with the careful estimate of the amount of money you expect each item to cost."

With such a chart before them, showing in detail what had been anticipated during the past years, and then what had actually occurred, would not the supply department be in a much better position to forecast future requirements than simply going by guess? It is true that many unforeseen events quickly reverse the building progress of our companies, and often work carefully planned is of a sudden indefinitely postponed. Then again work of large moment is decided upon and undertaken upon short notice, but any growing organization has a certain more or less fixed accretion to its business, and has even a certain fixed amount of maintenance, repair and replacement work, which increases in a fairly regular proportion as the territory covered expands and the age of the material installed advances.

Most of our companies operate on budgets, which comprise major estimates composed by the several departments, and approved by the final authorities. These budgets may cover six months or a year, and even longer periods, but some definite projects are advanced, approved, and then the execution thereof planned in detail. This budget likewise contains estimates of operating expenses, and should have the details from the sales department of its proposed selling campaign.

It seems quite feasible for the supply department to take this budget when approved and obtain from the engineers in charge the list of material required for the jobs, the time table showing how the job is expected to progress, and when the different items are needed. With such information the supply department could map out a campaign for the period covered that will enable it to have the supplies when needed, without tying the company's money up for too long a period, without overcrowding the storerooms and without causing the construction department losses on account of non-arrival of material. The further in advance such information may be worked out, the better results may be accomplished.

Undoubtedly the supply department's greatest trouble is in keeping the amount invested in material and supplies at a reasonable and minimum figure, as the other departments, of course, wish material at hand when needed, and are apt to lean to the side of overages rather than shortages. Is there any better way of keeping down this investment, than by having a routine whereby it is necessary for the other departments, their budgets approved, to furnish the supply department with material details for the different projects? Such a record over a period of years would be conclusive proof if an over-investment or a shortage of material occurred as to who was responsible therefor.

By far the greater part of the work of construction is carefully planned. Sales campaigns of the commercial department likewise are outlined well in advance. and even much of the maintenance of the operating department is worked out in advance. Hence it is not at all impossible for these departments to furnish considerable details relative to material demand, which leaves an opportunity for the supply department to budget its demands.

The work in the supply department of making a budget should be gone over carefully, but need not be at all elaborate. A card or loose leaf ledger sheet would be made up for each item which should show in the beginning, by periods, the consumption for a

*C. A. Kelley, The Southern Sierras Power Company, chairman; W. J. McCullough, Southern California Edison Company; D. P. Mason, San Joaquin Light & Power Corporation; I. B. Walther, The California Oregon Power Company.

past number of years, with average prices for each period, the source of supply, probable time of delivery, the quantity on hand, and then the probable future requirements for the periods the budget covers, detailed month by month, or period by period, if a shorter or longer time was better adapted to the company's plans. The probable future requirements may be further segregated as to whether needed for a large specific job or for general small extensions or maintenance and repair work. This segregation would assist revision of the budget to meet sudden changes in general commany plans. Information if possible relative to the past history should be shown for the same period as the estimates for the future. As history progresses the actual data relative to the purchase and use of the item should be placed opposite the estimated, and running a period of time, this would be invaluable and to a surprising extent enable accurate planning or budgeting. Estimated pricing of these cards would make it possible to furnish the financial department with a forecast of money needed.

The material and supplies budget should also contain an estimate of the money necessary for salaries, rents, insurance, equipment, and miscellaneous expenses, detailed month by month.

Spare parts for machinery and parts of machinery carried and accounted for by the supply department form a part of the total investment in materials and supplies. Under this category should be included spare substation transformers (if carried in materials and supplies and not property), as they were purchased for a particular purpose and cannot be used generally. These items should be carried in a separate class from the general supplies and should be budgeted (planned for) separately. The ordinary distribution transformers and all meters however, should be controlled and budgeted as other supplies, for an overstock of these items is a greater possibility than any other items, and on account of the individual costs a greater menace to over investment.

The budget can be made a great aid to economical and efficient management of the supply department, and like all work of this department must be undertaken in considerable detail, however the fact must be borne in mind that too much detail in connection with smaller items might raise the cost considerably above any benefit to be derived. In such cases general amounts and costs should be entered.

Standardization of Material and Equipment

Report of Committee No. 3, Purchasing and Stores Section*

THIS committee recommends the appointment of a standardization committee, composed of representatives from the engineering, operating, construction and stores department. The duty of this committee would be to investigate each item or article now in use as to its quality, cost and purpose for which purchased.

In selecting a standard material for a given purpose, it is necessary to study it from several points of view:

1. How many uses can this material be put to?
2. What other materials resemble this material and can the one be substituted for the other?
3. What quality of this material will be good enough for the purpose it is to serve?

When a standard is decided upon, a written description should be prepared specifying just what is wanted. When certain items have been agreed upon as standard, the responsibility for enforcing their use should be that of one of the company executives, for standardization can only be effective to the extent of its observance. When standards are changed prompt notice should be given the stores department and they should be instructed as to whether the stock on hand, or that which might come in from the system, is to be used or considered obsolete. When the market conditions are such that a standard item cannot be procured, the standardization committee should pass on the material to be purchased for temporary use.

When the need for a certain item of material passes, due to change in construction methods, the stores department should be advised of the discontinuance of the article so that immediate disposition can be made of the stock on hand. In agreeing upon an item to be considered standard, the committee should merely specify the article but not the brand to be purchased, as this would eliminate competitive bidding.

Some of the advantages which would result from standardization might be summed up as follows:

1. Material most adaptable for the purpose intended would be furnished.
2. Reduces the number of items carried in store stock and as a result lessens the material and supplies investment.
3. Decreases the number of requisitions, thereby reducing ordering, purchasing, accounting and handling costs.
4. Makes the preparation of estimates more simple.
5. Permits larger purchases of the one item adopted as standard, which means a better price on account of being able to take advantage of quantity discounts.
6. Less storage space is necessary.
7. Shelves are kept clear of slow moving and obsolete material.
8. The labor cost necessary in ordering, purchasing, receiving, inspecting, testing, disbursing and accounting is greatly reduced by the smaller number of requisitions placed.

*D. P. Mason, San Joaquin Light & Power Corporation, chairman; L. S. Jones, The California Oregon Power Company; C. R. Eccles, Western States Gas & Electric Company; G. C. Robb, Pacific Gas and Electric Company; F. F. Henry, Southern California Edison Company.

Inspection and Testing of Material and Equipment

Report of Committee No. 4, Purchasing and Stores Section*

THIS committee recommends that a thorough and practical system of inspection of all materials be installed that will cover quantity, quality, and serviceability of all miscellaneous materials and supplies. All purchases should be made according to definite standards and specifications and all materials and equipment received from vendors must be inspected and tested before accepted.

These tests and inspections may be made during the course of construction at the manufacturers' plant, or after manufactured, but before shipment, or after receipt at destination. The nature of the material and the process of manufacture will often determine which of these tests is preferable. Tests during construction and before shipment are generally of a technical nature and should be made by the company's own engineers, or by outside testing engineers employed for that purpose. Tests at destination requiring technical knowledge should be made by the department qualified.

Those responsible for the tests and inspection should be furnished with copies of the purchase orders and the standards and specifications upon which the material was bought. The reports of these tests and inspection should be brief and to the point, so worded as to indicate clearly whether the material or equipment conforms to the standards and specifications.

A copy of these reports should be furnished the supply department, as only in that way can the purchasing agent know that the manufacturers and vendors are shipping what is wanted and paid for.

Visual inspection by the receiving department and storekeeper should be made for breakage, shortage, overage and to determine whether the material meets specifications. In this storekeepers should be governed by their personal knowledge obtained by experience and through daily contact with men who use the material.

Chemical tests by the chemistry department should be made of paints, oils, creosote, rubber, leather, pipe-covering material, soap, etc. This department should also make periodical tests on the galvanizing of standard line hardware.

Mechanical and electrical tests are to be made by the department responsible for technical testing, to determine strength, power, conductivity, insulation, etc. This will cover such items as line hardware, transformers, regulators, switches, motors, compensators, street-lighting equipment, transformer oil, switch oil, rubber gloves, etc. Metallurgical tests should be made of iron, steel, welding rods, etc. Miscellaneous items, such as

* C. R. Eccles, Western States Gas & Electric Company, chairman; D. P. Mason, San Joaquin Light & Power Corporation; C. A. Kelley, The Southern Sierras Power Company; C. D. Weiss, San Diego Consolidated Gas & Electric Company.

pipe fittings, poles, crossarms, lumber, tools, lamps, and other electrical supplies, are tested under the supervision of the stores department.

The following shows briefly for what certain items of material are tested:

Cast iron pipe is tested for breaking strain, deflection, tensile strength, bad beads, core rubs, core swells, bad fells, and mold scabs.

Cement is tested for fineness, consistency, composition, specific gravity and time required for setting.

Copper wire is tested for its tensile strength, conductivity, uniformity in diameter, smoothness and condition of joints.

Transformers are tested for core loss and exciting current.

Meters are tested for their accuracy.

Transformer oil should be given insulation tests.

Lubricating oil should be given viscosity, flash and fire tests.

Crossarms should be tested for strength, and should be closely inspected to see that they meet specifications.

Poles should be tested by an experienced pole man for dead timber, worms, breaks, dimensions, etc.

Pole paint should be tested for penetration qualities, weight, film, drying time, persistency of color and life of service under salt and dry air conditions.

Wood pins should be inspected for dry rot, knots and damaged threads.

Steel insulator pins should be tested for strength and all studs should be tightened to prevent them from working loose on the line.

Street series lamps should be tested before placing in stock to determine whether any tips are broken and to detect defective seals and broken films.

Supervision of Materials and Equipment

Report of Committee No. 5, Purchasing and Stores Section*

THE intended subject for this discussion was "Should all material and equipment, whether in the store or applied on requisitions and shipped to the job or district, but for some reason not used, be under the supervision of the stores department?"

Using this interpretation, this committee makes the following recommendations:

The general storekeeper shall have entire charge of all material belonging to the company, which is not actually in use, regardless of location.

Our reasons for making this recommendation follow:

1. The stores department was organized primarily to handle the material and equipment required for use by the various departments, because experience has proved to the satisfaction of the management of all large concerns that operating, engineering and construction men give first consideration to the operating, engineering and construction problem and only afterward do they handle the material accounting which, nevertheless, is of such importance that it cannot be placed second to any of the activities of the departments mentioned.
2. The stores department organization is composed of men trained in the ordering, receiving, disbursing, reclaiming and accounting for material.
3. In order to render the most effective service, which means a sufficient supply of material with a minimum investment, there can be no intermingling of activities or responsibilities.
4. The physcal handling of material is vital to a successful regulation of the supply, and must be performed by men trained in the work, if the best service is to be obtained.
5. The general storekeeper is the one person in a position to know of excess or idle stocks and consequently is the one person who can reasonably be charged with the responsibility in question.
6. With the supervision of unapplied material, regardless of location, under the general storekeeper, and the fact that all requisitions come to the stores department, he is able to apply any excess or idle stock, eliminating the purchase of new material and a needless expenditure of money.
7. The costs of material and equipment used, as well as payroll costs, must be accurately reported to the auditing department, and it is the duty of store men to see that proper reports of such costs reach the auditor.
8. Should there be any question as to whether the stores department should be in charge of all materials regardless of location, a trip around outlying properties may be somewhat of a revelation. Such an inspection will reflect excess stocks and piles of junk lying around in back of buildings, under benches, etc., the value of which may run into thousands of dollars. Conditions like this can and should be corrected, however, if no particular official of the company is charged with the responsibility, the following, an actual experience, will illustrate what may be expected.

At a small power house there were found five new garden rakes and nine new hose valves, requisitions for which had been duly approved by department heads and charged to operating accounts. If such conditions are permitted, does it not encourage both physical and mental, as well as moral slovenliness? With such conditions existent, a storekeeper cannot be honest with himself or with his company, and cannot feel that he is conducting the business of his department in such a way as to merit the approval of the company officials or the California State Railroad Commission. Furthermore, the employees, young people in many instances, will quite likely allow their personal standards to be influenced by the seeming indifference on the part of the company with regard to the careless expenditure of money.

* W. J. McCullough, Southern California Edison Company, chairman; R. E. Thompson, San Diego Consolidated Gas & Electric Company; William Maddock, Los Angeles Gas & Electric Corporation; I. B. Walther, The California Oregon Power Company.

The Procuring of Material and Equipment

Report of Committee No. 6, Purchasing and Stores Section*

MATERIAL procurement is of vital importance to the stores department, for upon it rests largely the success or failure of material control. It is also quite important from a company point of view because of the fact that delayed shipments mean a halting in the work and an added cost in construction. Requisitions are prepared and placed on the purchasing department, with only sufficient time to permit reasonable deliveries and if constant delays are experienced, it results in increased orders with an unnecessary added investment.

Since the general storekeeper is so vitally interested in his stock and has a much better idea of immediate requirements, we recommend that the tracing for material be under his supervision. We believe that a very close follow-upon system should be installed. This system should be that all purchase orders specifying a certain date of delivery will come to the tracing department desk, on that same date, or in advance if the case is one of an urgent nature and it is desirable to hasten delivery.

There will be cases when the construction program is changed, and the necessity for the material eliminated; this the general storekeeper will know and with the tracing being done in his department, deliveries may be held back or orders cancelled. The matter of tracing should never be permitted to become a mere routine for when this stage is reached the plan becomes ineffective.

A great deal depends upon the purchasing department in the matter of delivery. Good buying does not mean necessarily purchasing at the lowest market price, but rather at the lowest possible price consistent with the requirements of the requisition.

In placing an order, the purchasing department should be careful to select a vendor who has rendered efficient service in the past and one with a reliable reputation.

When a vendor, through repeated failure to meet its obligations has proved that its promises cannot be re-

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lied upon, we suggest a discontinuance of business with this firm, until such time as we can be assured that any agreement it might make will be lived up to, barring, of course, conditions over which it has no control.

Material and Equipment Handling Devices

Report of Committee No. 7, Purchasing and Stores Section*

THE type and amount of equipment necessary for the economical handling of stores department material, depends largely upon the quantities and weights of material to be handled, the storage space available and the location of buildings and yards. In order that the production and operating costs be kept at the minimum, it is just as important that the storeroom be equipped with up-to-date equipment which will save time and labor, as it is for the shop or construction department to be furnished with the proper tools and machinery.

Ample room to have a place for everything and everything in its place is the only way a store can be operated economically and with the minimum stock. Buildings should be of sufficient size to permit a segregation of stock. Suitable yard space should be provided for the proper storing of such material as cannot be placed in the warehouse. There should be trackage facilities so that cars can be placed at the warehouse platforms, thus avoiding extra handling.

Locomotive cranes are recommended for all general work for the reason that in addition to answering the purpose of handling all heavy material by power, these cranes can be used for yard switching and moved conveniently to different places where needed. They are of especial value in the loading and unloading of poles. The handling of scrap by hand is a tedious and expensive operation and it is recommended that in companies where the quantities of this kind of material to be handled are large, that the locomotive crane be equipped with generator and magnet.

Overhead traveling cranes should be installed over transformer storage space for use in handling heavy equipment such as transformers, switches, regulators, etc. Where the storeroom is small and the use of traveling cranes unwarranted, we recommend the motor driven chain hoist, of sufficient capacity to meet requirements

When yard space is limited and the installing of locomotive cranes impossible, we suggest an 8- or 10-ton capacity stiff leg derrick, with an 80-ft. boom, operated with an electric driven hoist. This device will prove a labor saver in the handling of poles, wire, pipe and heavy material. Jib cranes mounted on trucks or trailers are of great value in picking up heavy materials.

The automatic scale is of particular advantage in a storeroom where much weighing has to be done, for the reason that the weight automatically shows on the dial thus eliminating the time lost in balancing and putting on extra weights.

In determining the quantity on hand of such items as nuts, washers, etc., where the time necessary to count makes the cost excessive and it is desirable to compute from weight, the counting machine is recommended. These machines are arranged to work on certain set ratios, usually ranging from 10 to 1 to 200 to 1. A scoop hangs on the beam which acts as a counterpoise. The weight of the contents of the container which is placed on the platform is balanced by a small quantity of the same article placed in the counterpoise pan. The contents of the pan are counted and multiplied by the ratio of the machine and to this is added the number of articles in the counterpoise pan.

The use of lift trucks in moving heavy material such as switches, transformers, etc., from one location to another is very desirable. Where the quantity of material handled is large, much of it of heavy character, the use of electrically operated tiering or lifting trucks is recommended. They can be used to advantage in not only tiering such items as wire and cable, but also in loading trucks where the store floor is not elevated to truck level. Where crossarm timbers are purchased in the raw, the manufacturing being done by the company, cut-off saw, rip saw and boring machine are recommended. The use of a crossarm painting machine has shown considerable saving. This machine is constructed so that the arm passes through an enclosure where the paint is sprayed to all four sides at the same time by means of an electrically driven force pump. This machine can be connected to the gravity conveyor and the arms unloaded, painted and stacked in the one operation. As an explanation of the saving effected through the use of this machine the following might be of interest.

Using the old method of painting crossarms by dipping, five men will paint and stack about 1,000 arms per day, or it would require approximately one and one-half days for these men to unload, paint and stack a carload, or 1,500. By using the gravity conveyor and the painting machine, the same men will do the work in less than five hours. In addition to this saving of labor, there is a saving of about 25 per cent in the amount of paint used.

The painting of poles by the use of compressed air has proved quite successful. By the use of this device one man can paint approximately seventy 40-ft. poles in a day, while with the brush it will take two men the same length of time to paint 65. We recommend the use of this equipment not only because of the saving in labor effected, but for the reason that the work is much more satisfactorily done, the cracks and checks being completely filled.

Gravity conveyors are used as a means of saving in the unloading of such material as cement, crossarms, boxes, etc. Oil dryers and filters, for the purpose of purifying and filtering transformer oil should be installed. Electric trucks and trailers are strongly recommended for use in moving material within the storeroom and from one place to another in the yard. Rubber stenciling outfits and paper stencil cutting machines are of advantage in the shipping room. Wire measuring machines should be a part of the equipment of every store, because of the time saved in filling orders.

In addition to the above, the storeroom should, of course, be well supplied with items such as two and four-wheel trucks, small scales, etc. In the office there should be a sufficient number of typewriters, adding machines, calculators and comptometers so that clerical work may be handled efficiently.

* C. D. Weiss, San Diego Consolidated Gas & Electric Company, chairman; C. R. Eccles, Western States Gas & Electric Company; H. E. Cox, Southern California Edison Company; G. C. Robb, Pacific Gas & Electric Company.

Stationery and Printing Department Economy

Report of Committee No. 8, Purchasing and Stores Section*

IT is the opinion of this committee that the handling of office supplies, stationery and printing, in our companies is of such importance as to effect a large saving if properly organized and sufficient attention given. The function of the stores department is to receive, ship and account for material and supplies and inasmuch as it is set up to perform this work, it is believed that the ordering, receiving, storing, distributing and accounting for office supplies and stationery should be placed under the jurisdiction of the general storekeeper.

Stationery and office supplies should be a separate section in the stores organization, and should be supervised by a man thoroughly conversant with this line of work. Stationery is used by all departments from the office of the president down and is subjected to a greater amount of waste than any other item of supplies, and for this reason should be carefully watched. Again, stationery supplies are made up of many small items, each in itself of small relative value, so that no striking economy can be effected in any one place, but the aggregate loss through careless handling is large. One of the most effective means of economizing is through the adoption of standards.

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Careful consideration should be given the size of all forms, so that they may be cut from stock size paper without waste. This might be accomplished by placing the responsibility with one man, to whom all new or revised forms would be sent for approval as to size and grade of paper, before being sent to the printer. This man should be familiar with stock sizes and grades of paper. Another method by which economy can be realized is by minimizing, as far as possible and practical, the number of forms used.

The grade of paper upon which a form is printed should be determined by the purpose for which it is intended, if for temporary purposes, a lower grade, and if for a permanent record, a better quality. Whenever possible, forms should be consolidated.

It is generally agreed that in revising old forms, or preparing new ones, they should be correct in every detail before sending to the printer, so as to avoid loss of time and money in altering proofs. Only standard forms and those not subject to revision should be printed in large quantities, as a noticeable loss in money is incurred in writng off surplus stocks and discarded forms. Wherever possible, forms that have been discontinued should be cut up and padded for use as memorandum or scratch paper. When it is necessary to print instructions covering use of a form, the instructions should be printed on the face, rather than on the back, so as to eliminate the necessity of running through the press a second time.

Stationery forms and paper should be kept wrapped, and not open on the shelves, so as to prevent dust settling on the outer sheets, resulting in a loss of the first sheet, or several sheets if padded in sets.

The extravagant use of carbon paper is a serious waste in most company offices. A point which might be considered with a view towards economy, is the centralizing of all stencil and duplicating work so that less machines will be necessary and so that there will be continued use of not only the machine but the operator. There is a difference of opinion as to whether it is economical to manufacture our own typewriter ribbons, ink, mucilage, etc. Some companies are already doing this and claim a considerable saving is effected.

Typewriter ribbons are discarded by the stenographer at any time without question, regardless of the fact that they are but partially used. This lack of economy should be corrected by having someone in authority inspect all returned ribbons before new ones are issued.

There should be attached to the stationery and office supply section one or more mechanics, capable of overseeing and repairing office equipment such as typewriters, calculators, comptometers, adding machines, etc., so that they may be kept in first class working order. It is just as necessary that careful attention be given to this class of equipment as that given to motor vehicles and other machinery which is in continuous use. We all agree that the service rendered by the distributors of this class of equipment is only half hearted and generally unsatisfactory.

The stationery and office supply storekeeper should be privileged at all times to offer suggestions and recommendations in connection with the purchase of these commodities, as his experience enables him to know pretty well what would be best suited for the purpose used, and whether or not efficient service is being obtained from the articles he carries. For instance, if a department is using too much carbon paper or too many typewriter ribbons in its usual duties, he can investigate as to the reasons, whether due to poor quality or careless handling. He should have authority to survey the stationery and office supplies in any department at any time, as to quantity and condition of stock, and to question any requisition reaching him that in his belief calls for too large a quantity, or is in any other way unusual.

Printing Department

A print shop operated in connection with the stores organization has demonstrated a large saving. We do not think it would be economical or advisable for the average public utility company to set up a printing department to handle its full requirements, as there would not be sufficient work to keep the machines and men busy all the time. Also certain branches of the work require high salaried mechanics. We do, however, recommend a plant consisting of two or three different size presses, a power cutting machine and a padding machine, which we believe will be sufficient to handle a greater part of the work.

A few of the advantages derived through the operation of a company printing plant might be stated as follows:

1. Costs are reduced.
2. With our knowledge of costs we are better able to check the quotations of dealers to whom we must give a part of our work.
3. There is no delay to company requirements.

The previous paragraphs of this paper deal entirely with the economies which might be effected in the ordering and handling within the storeroom, but the possible economy with the greatest possibilities lies in the distribution. If we distribute excessively, we buy excessively, for the demand governs the buying. This results in an over investment which costs the company in interest, taxes and insurance unnecessarily.

For this reason a very complete system of checking requisitions should be inaugurated. There is a question as to just how an intelligent check of stationery requisitions can be made, due to the fact that the storekeeper has no definite knowledge of the various office requirements. A system might be installed whereby the head of each department or office be asked to furnish a list of his monthly requirements of each form, office supplies and blank sheets, also the number of employees in his office. Provided with this information the storekeeper could cut down or question requisitions calling for quantities in excess of the amount shown on list furnished by the department head. It is common practice, however, for offices to order a certain number of each form and so many pencils, pens, etc., each month regardless of the amount on hand, so our systematic check of requisitions fails unless followed up by a periodical check of stock at each location. It should be the duty of someone to make this check and he should have the authority to return all stock found in excess of requirements as shown on the department list.

Purchasing Department Organization

Report of Committee No. 9, Purchasing and Stores Section*

In our report on purchasing department organization, we have been governed by the knowledge that an organization suitable for one company would not be suitable for another and have, therefore, touched only on the essential requirements as to personnel and routine, leaving the completing of the detail, as to number of assistants and record requirements to the individual company.

There are many factors entering into the organization of a purchasing department, among which may be included:

1. Whether the company or corporation of which it is a part, is of large or comparatively small magnitude.
2. Whether the company or corporation is located in or adjacent to a large business center.
3. Whether or not the general store is a part of the purchasing department, operating under one head.
4. Whether it is the policy of the company to maintain large stocks.
5. Whether shipments are made direct to the field by the vendor.

There are other factors which cannot be spoken of here because of lack of space.

Assuming that the purchasing department operates as a separate departmental organization of the company, its personnel should consist of the purchasing agent and his assistants or buyers, with sufficient clerks, stenographers and typists to effectively and economically carry on the work of the department under the general direction of the purchasing agent. The duties of buyers should be classified as to materials and supplies, thereby enabling the buyers to become more or less experts in their respective lines. Care should be used, however, to the end that the organization be so trained that in the absence of one or more employees whether they be buyers or clerks, that those remaining may be sufficiently familiar with the work

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of the absentee that his work may be readily taken over and carried on without loss of time or efficiency.

It goes without saying that one of the first essentials of a purchasing agent and the entire buying personnel is that they have the confidence of those with whom they come in contact. This applies not only to the vendor or individual himself, but to his representatives as well, as it is through him that the personal contact is made. In order to secure this confidence square dealing and courteous treatment should be the slogan. With this platform the purchasing agent commands the respect of those with whom he does business, resulting in better relationship between his company and the vendor. With a man of such a calibre at the head he will tolerate nothing less from his assistants.

Inasmuch as centralized buying is the reason for existence of the purchasing department and the needs of the company's store and several departments are made known to the purchasing department by requisition, care should be used in the preparation of such requisitions, thereby enabling the purchasing department to intelligently handle their requests to the best advantage.

Next in importance is the purchase order, its size and form and number of copies depending upon predetermined policy. It should, however, be so constructed and worded as to enable the vendor to handle it with dispatch and the least possible chance of misunderstanding or error. In addition to quantity, description of material and destination of delivery, the purchase order should show price agreed upon, terms, f.o.b. point, shipping or delivery date agreed upon, routing and any other information that will insure proper filling and delivery of material ordered. Considerable time and expense may be saved by use of window envelopes in mailing. The use of the acknowledgment of order form is a moot question.

The securing of bids should be handled by the buyer responsible for the purchase of that particular commodity, written requests where necessary being made over the signature of the purchasing agent and quotations being adddressed to him personally, that he may be continually in touch with all matters pertaining to purchases made and to be made. It frequently happens that the commodity to be purchased is of a technical or special nature, in which event, all bids should be referred to the engineering committee or the individual from whom the request for bids or purchase emanated. Upon completion of the transaction, all quotations should be filed with a copy of the order appended thereto.

It has been found quite an advantage in one large utility to have tracing on the vendor done by the general store, that department having in its possession a copy of the order and is better acquainted with the urgency of the situation and can act accordingly. Tracing of materials for departments other than the general store should be done by the purchasing department. In either case, this duty should be charged to a live up-to-date person, with good judgment, diplomacy, and capable of writing a good business letter.

The advisability of keeping a price record is obvious. The use of a card or loose leaf ledger system may be employed. This price record should show date of purchase, price and quality, f.o.b. point, etc., such data being secured from purchase orders or invoices, the former medium being most satisfactory, assuming prices are shown thereon, as it does not delay the handling of invoices and in consequence possible loss of discounts. With reference to basis of price, it cannot be arbitrarily said as to whether it is of greater advantage to secure prices f.o.b. point of shipment or destination as circumstances under which shipment is to move would govern.

So far as general routine is concerned, that will, of course, depend upon the particular set-up of the organization and is not important, as ideas along this line will always differ. However, in a general way the purchasing department, while being the spending organization of an institution, can by careful and honest dealing, straight forwardness and square shooting, not only be the medium of saving a company a vast amount of money but become a friendly and important contact for the company with the public at large.

Stores Department Organization

Report of Committee No. 10, Purchasing and Stores Section*

IT is impossible, due to difference in size and the varied conditions under which public utility companies operate, to outline an organization that would be applicable to all, but we will endeavor to state the personnel and departments necessary to effect an efficient working force.

General Store

General Storekeeper: The general storekeeper should be the active executive of the organization. He should have a thorough knowledge of all matters pertaining the ordering, handling, distributing and accounting for materials and it should be his duty, not only to provide and care for material, but to know that it is properly applied. It also will be his duty to maintain organization, anticipate demands, provide suitable facilities, curtail expenses, question unnecessary purchases, reclaim material and arrange for the sale of scrap and obsolete items.

Assistant General Storekeeper: He will assist the general storekeeper in the exercising of general supervision and act during his absence.

Traveling Storekeeper: The traveling storekeeper should be the personal representative of the general storekeeper. He should supervise physical and accounting conditions of all district or division stores. He should have a general knowledge of materials and be conversant with the complete store organization.

Chief Clerk: The chief clerk should be in charge of all clerical work. It should be his duty to audit invoices, make payrolls and prepare statements of cost, stock balances, etc.

The usual stores office force, we believe, will be more efficient if a well defined division of responsibilities is placed, and with this in mind we would suggest the followng bureaus:

1. Accounting bureau.
2. Requisition bureau.
3. Payroll bureau.
4. Inventory bureau.
5. Stenographic bureau.
6. Filing bureau.
7. Mailing bureau.

The employees of these bureaus would report direct to the assistant general storekeeper and chief clerk.

The location of the general store is of vital importance as upon this hinges largely the efficiency of service and the costs in transporting material. It should be located as near the center of the territory covered as possible, provided such location does not increase freight charges on received material more than the saving effected by such location.

When the territory covered is large, it is sometimes advisable, owing to market conditions, to have a second general store, but this is not good practice if it is possible to avoid, as it results in duplicate organization and an increase in material and supplies investment.

With a view to economy, we recommend that store buildings be of sufficient size to permit the proper segregation of materials. The real purpose served by the general store is promptness in delivery, and its system must be such as to permit of no delay in shipping. With this in mind we suggest a sectional arrangement of all material, with a view of economy in handling and with a further view of having a man in charge of each class of material who should be an expert in this particlar class, and who should actually handle it, both in and out.

As an explanation of the sectional arrangement referred to above and a probable convenient segregation as to class, the following might answer.

Sec. 1. Motors, motor starters, regulators, transformers, etc.
Sec. 2. Meters, current and potential transformers, telephones and parts, etc.
Sec. 3. Hardware, line construction and miscellaneous material.
Sec. 4. Electrical material.

* William Maddock, Los Angeles Gas & Electric Corporation, chairman; G. C. Robb, Pacific Gas and Electric Company; C. D. Weiss, San Diego Consolidated Gas & Electric Company; H. O. McKee, Southern California Edison Company, chairman, Purchasing and Stores Section.

Sec. 5. Cross arms, guy covers, wood pins, poles and lumber.
Sec. 6. Cable and wire.
Sec. 7. Stationery, office supplies and fixtures.
Sec. 8. Scrap and obsolete material.

Each section should be operated as a separate store, the section storekeeper keeping his own stock book. He should be furnished with a copy of every order for the purchase of material for his section. He should record, receive and check all material and see that it is properly placed on the shelves. At the end of each month he should inventory his stock, enter on his stock book the amount necessary to order to meet requirements for a certain agreed upon period, also the amount of unfilled requisitions and turn over to the requisition clerk who will check each item, making warranted changes and corrections and will then prepare requisitions to cover, inserting in the stock book the requisition number, after each item ordered.

Reporting directly to the assistant general storekeeper should be the general stock clerk in charge of requisitions, general foreman, section storekeepers, receiving and shipping clerks and printing department superintendent. The general stock clerk or requisition clerk, should prepare all requisitions. They should be written according to section. The general foreman will have charge of all physical conditions as regards the actual handling and storing of material as well as the general upkeep of the properties. Section storekeepers are required to inspect all materials received for their respective sections, call to the attention of the assistant general storekeeper items which are not standard, slow moving or interchangeable. The receiving clerk has charge of all material received until it is checked, unloaded and turned over to the section storekeeper. His force is divided into crews under a gang boss. The shipping clerk has charge of all shipping. The shipping crew packs and checks all material received from the various sections. He should have a daily schedule of shipping points so that full advantage may be taken of transportation facilities. The printing department superintendent should have full charge of the operation of the printing plant. He should have a practical knowledge of printing equipment, different weights of paper, methods of padding and costs of his department.

In connection with an efficient stores organization, there must be adequate space and facilities for the handling of scrap material as this is a very important phase of store work. There also should be a reclamation shop of sufficient size and equipped especially for this work.

As a part of each store organization there should be a fire squad, trained in the methods of extinguishing. This squad should be familiar with all outlets and should have a definite time allotted to drill.

Proper handling devices should be provided so that the work can be done economically.

District or Division Stores

In the preceding paragraphs of this report we have confined ourselves to the general store organization, but as many public utility companies operate over such extensive territories, it makes it necessary to install district or division stores at centrally located sectional points. As the operation of these stores differs somewhat to that of the general store, we make the following recommendations:

The location of a district or division store should be as near the center of the district it serves as possible. It should be considered a unit in itself, entirely independent from the general store but under the supervision of the general storekeeper. The usual force necessary to the efficient handling of a district store is district storekeeper, bookkeeper and one or more stock clerks. The district storekeeper should have charge of all work performed in the district store. He should place all requisitions, check all invoices, supervise all accounting, inspect and check all receipts, oversee the issues, supervise the arrangement of stock and see that the properties are kept in a neat and orderly condition.

The office routine is quite similar to that of the general store excepting that the district storekeeper deals directly with the auditor as far as the accounting for material is concerned. He should prepare a statement monthly of all debits and credits he has taken into his store accounts. The auditor should furnish him with a similar statement of debits and credits entered on the general books affecting his store, and these two statments should be reconciled. This will detect errors both of the district and the auditor, enabling adjustments to be made at the time, eliminating much checking at the time of inventory.

Particular attention should be given the issuing of material to line gangs. We recommend a requisition form, prepared to cover a period of one week or more, this form to be prepared in duplicate, one copy for the store and one for the foreman or material clerk on the gang. This will eliminate the writing of individual requisitions for each withdrawal from the store. In preparing this form it is advisable to print the description of the commonly used items, so as to simplify the filling of the orders and to make the checking more easy. The articles should be listed in alphabetical and sectional arrangements, down the center of the sheet. On one side, in the proper column, will be inserted after the item, the quantity drawn, on the other, the quantity returned. At the close of the period, the material clerk should take an actual inventory of his wagon stock, prepare a new sheet showing the different balances on hand. This should be the same as the figure shown as a balance by the storekeeper after he has balanced his previous week's sheet. This is done by inserting the quantities used on the "return to store" side of the sheet and the quantities taken from the line on the "issued" side. The difference between the "returns" and the "issues" should then equal what the material clerk shows as being on the wagon.

District storekeepers should keep the general storekeeper advised as to local conditions by sending him a monthly report showing the total stock value of material on hand and the status of all accounting and physical work. The money value of stock should be segregated under several headings as follows:

Meters	$ 3,000
Motors	800
Wire and cable	4,500
Transformers	3,100
Poles	2,000
Appliances and ranges	1,100
Miscellaneous	11,000
Total	$25,500

Annual Inventories of Material and Equipment

Report of Committee No. 11, Purchasing and Stores Section.*

THE object of an annual inventory of material and equipment of a public utility company where all material purchased is for use within the company, is to see by comparison of actual stock on hand with ledger balances, whether accurate accounting is being made of all supplies used. To avoid little or no interruptions in the receipt and disbursement of material during the time of inventory, and also as a means of obtaining an accurate count, a definite program should be outlined and followed.

This report is based on a decentralized system of stores where it is advisable to take an actual inventory once a year.

Dates of Inventory

The general storekeeper, or officer in charge of supplies, should prepare the first of each year a schedule specifying the date on which the various inventories will be taken. These dates should fall as near the end of the month as practical so that the general book balance of the auditor will reflect more nearly the actual inventory figure.

In arranging the inventory schedule, care should be exercised to see that not more than two inventories are planned for the same day, as it is necessary for a representative from both the stores and auditing department to be present and the number of men in these departments available for such work is limited.

Form of Inventory Card

The use of an inventory card has proved very satisfactory. The taking of every item is assured as the

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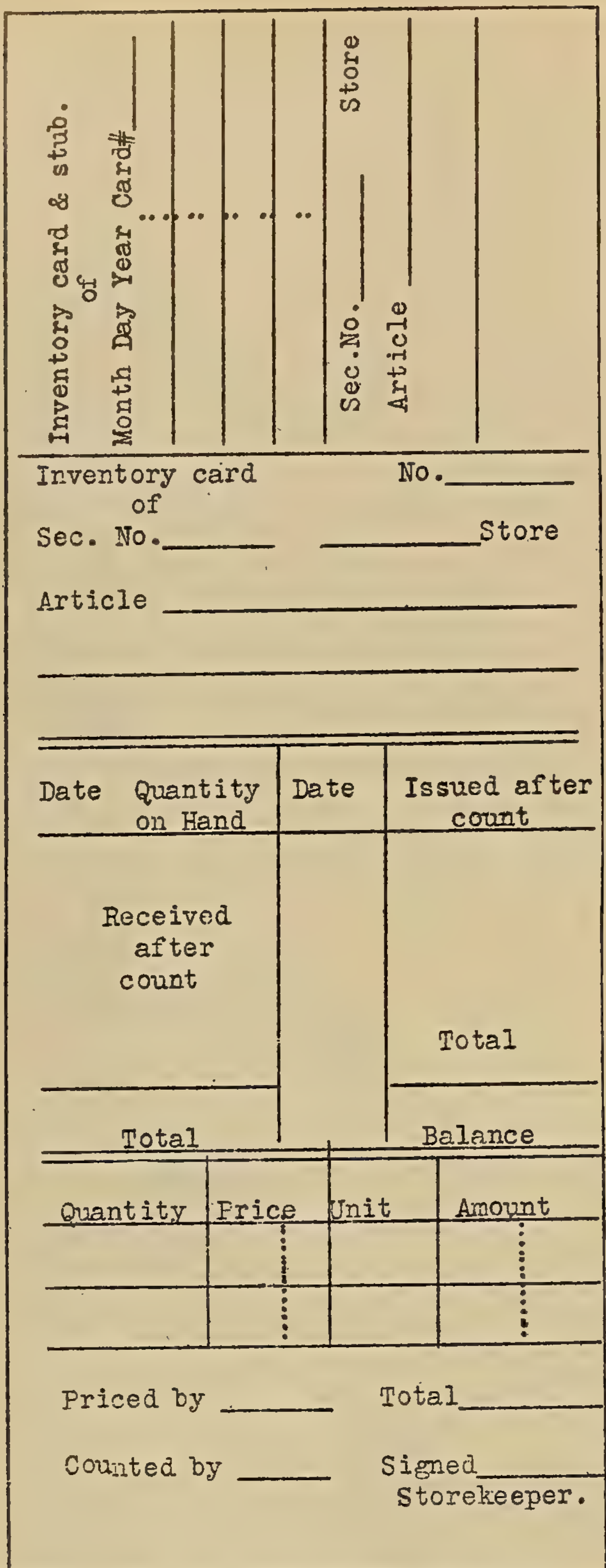

Inventory card & stub. of
Month Day Year Card#.....
Store
Sec. No.
Article

Inventory card of No.
Sec. No. Store
Article

Date	Quantity on Hand	Date	Issued after count
Received after count			Total
Total			Balance

Quantity	Price	Unit	Amount

Priced by Total
Counted by Signed
Storekeeper.

Fig. 1.—Sample Inventory Card

cards are numbered and written from the stock ledgers, and after the count has been made every number must be accounted for.

The sample card shown in Fig. 1 is suggested as very suitable. It provided for recording the following information:

1. Name of store taking inventory.
2. Date of inventory.
3. Card number.
4. Complete description of article.
5. Quantity on hand at time of count.
6. Quantity received after count.
7. Quantity issued after count.
8. Net balance on hand.
9. Quantity, unit price and money value.
10. Two or three spaces to allow pricing of material where there is more than one unit price for the same item.
11. Signature of person making the count.
12. Signature of person pricing.
13. Signature of the storekeeper.

Inventory Cards

The writing of inventory cards is a duty of the store force, and the work should be completed two weeks in advance of the count. Separate cards should be written for each item of material.

It is recommended that the numbering of cards be postponed until two or three days in advance of the inventory, due to the fact that the supply of certain classes of material shown on the stock ledgers will have been exhausted during this two week period, and there will perhaps be new items of material received which will call for additional cards. By handling in this manner the numerical and alphabetical arrangement will be kept in order.

Cards should be numbered consecutively beginning with No. 1 and the corresponding ledger page given the same number. The noun name of the material or equipment should be shown first, then the detailed description.

The party writing the card should indicate in the column marked "Unit" whether the material is to be taken by the thousand, hundred, dozen, each, weight or length. This information is of special benefit to the party counting the material.

Cards should be distributed at least one day before the count starts, and if possible placed on or near the material described. The work of placing the inventory cards should be assigned to a stock man who is thoroughly familiar with every article in stock. Employees less familiar may assist in counting the material.

Indelible pencil should be used in inserting the quantities on hand. No erasures should be made. If the recheck of an item reveals an error, a line should be drawn through the original figure and the new or correct amount shown. The person making the change should initial the card.

In recording serially numbered equipment the quantity only should appear on the face of the card. The serial numbers should be listed on the back with cost price following each number.

Care should be taken in recording the RECEIPTS and ISSUES after count in order that the net figure will be the actual quantity on hand at the time inventory is taken.

When an item is found for which there is no card, indicating the material is not posted in the stock ledgers, a card should be written and given the number next higher to the highest number in the stock ledger. A record should be kept of these cards as to number and description of material.

When the count has been completed, and all departments interested have satisfied themselves as to its correctness, the cards should be gathered up, put in consecutive order so as to be sure none are missing, and handed to the storekeeper for pricing. Cards should then be totaled, priced, extended, comptometered and posted in the stock ledgers. Cards should be kept as neat and clean as possible and should be legible as they are used in compiling the final report.

Inventory Card Stub

The sample inventory card shown in Fig. 1 has a stub attached. Ordinarily these cards should be made without a stub. Where equipment or spare parts are carried in stock from year to year the use of the stub is recommended. It is also suggested that the stub be used in cases of special items, the description being hard to get, and not commonly known by the average stockman.

The stub portion of this card should show, date of inventory, card number, section number and complete description of the material as shown on the main portion of the card. Cards should be associated with the material in the regular manner, and fastened thereto by means of tag wires. Each year that the material bearing stub tag remains in stock the new inventory card should show a reference to the original stub number and date.

As a means of associating the items shown in the stock ledger with the material bearing the inventory stub card, the word "Tag" should be stamped or written after the corresponding card number in the ledger. This eliminates the necessity of writing stubs year after year. At the completion of the count the stub portion

of the card should be torn off and left attached to the material.

Preparatory Work

The necessity for advance work in preparation for the inventory cannot be over emphasized, as upon this will largely depend the taking of the inventory accurately and quickly.

Clerical

Ledgers should be balanced at least one week before inventory. About 75 per cent of the accounts will not be re-opened and the re-balancing of the few that will have to be re-opened will be more than offset by the time saved. Keep all the current work up to date.

Comparing the ledger balances with the material on hand several times during the year is very important. This reveals any discrepancy which may be easily located and adjusted, thereby saving much time and insuring a better inventory.

Care should be taken to see that the description of the bin card or material tag is full and complete and that it corresponds with the description on the stock ledgers. This will make the work of associating the inventory cards with the material much easier. Tracers should be sent out covering all delayed billings.

Physical

Shelf stock should be arranged so as to facilitate the work of counting. Small items should be tiered in uniform even rows, which will eliminate the counting of each separate piece.

Wire should be segregated carefully. When the original tags are missing the coils should be weighed or measured and tagged with the tags arranged so they will be in plain view.

Serially numbered apparatus should be arranged so that the name and number plate can be easily seen.

As near as practical the shelf stock should conform to the alphabetical and sectional arrangement of the ledgers.

All scrap should be disposed of prior to inventory, but if this is impossible, it should be segregated as to classes, weighed or measured and tagged.

Stock should be reduced to the very lowest point consistent with good service, so as to avoid unnecessary work in counting.

When the same material is located in more than one place, a notation to this effect should be made on the bin card, showing the quantity and location of the surplus.

Partly filled containers of oil, paint or other liquids should be tagged and the contents and quantity shown.

All poles should be marked with length nails or tags and should be piled neatly and segregated as to kind and length. This will eliminate the work of measuring and tallying.

All scales and weighing machines should be listed and balanced to insure accurate weights.

Arrangements should be made to eliminate as far as possible all issues and receipts on the day the count is made.

If additional help is required, arrangements for the necessary men should be made in advance so that no delay will be experienced in commencing the work.

After the inventory has been compiled it should be checked against the entries made in the stock ledgers from the inventory cards. Special attention should be given the unit price. Many errors are made through the confusion of each, hundred and thousand prices.

If such items as nuts, washers, etc., are only carried in small quantities they should be tiered neatly and uniformly on the shelves and may be inventoried by counting the number of rows or tiers and multiplying by the number in each. For heavy stocks of such items, when the counting would be very tedious and costly, a sufficiently accurate count may be obtained by computing the actual weight on a hundred and figuring the lot by total weight, using the weight of 100 as a base. A more desirable method would be the use of the automatic counting machines which work on the principle of weight, and are figured on certain set even ratios ranging usually from 10 to 1 and 200 to 1.

Such material as bar steel and iron, when the stocks are small, should be taken by actual weight. When the quantities are large the inventory may be obtained by measuring the bars and multiplying by the weight per lineal foot. Tables showing the weight per lineal foot of the various sizes and kinds of bar steel and iron may be obtained by referring to any standard heavy hardware catalog.

It is very difficult to recommend a satisfactory way to inventory lead covered cable. On account of it being very injurious to this kind of cable to uncoil and recoil, and the work of melting and resoldering the ends quite expensive, we recommend that it be actually measured only as a last resort. The following is suggested as the most practical way to handle. Fasten securely to each reel or coil a tag showing complete description and length. When reels contain more than one piece, the reel tag should show the respective lengths and positions they occupy on the reel. On this card should be kept a careful record of all issues during the year, and at the time of inventory the net figure as reflected by the tag should be the actual quantity on hand. Should this tag be torn off and there be but little cable on the reel, the number of turns may be counted and a fairly accurate length obtained by figuring the circumference and multiplying by the number of turns. In case of a full reel where the tag is lost but the tare weight is shown, the length may be ascertained by figuring the weight per 100 ft. as based on the net weight of the reel.

An over and short report should be made of all differences of one dollar or more. Should the net overage or shortage shown on this report be very different to the net overage or shortage between the auditor's balance and the total inventory it will be evident that there has been some error made in accounting or posting to the stock ledger. If, however, the overage or shortage as shown by this report is practically the same as the auditor's difference, it will indicate that the error is in the actual handling of material. By the use of this report the items showing large differences may be picked up, and adjusted.

All work in connection with the inventory should be given preference so as to avoid confusion and error. Colored chalk or lumber crayons should be used in checking such items as pipe, cross arms, poles, guy covers, etc., as an indication that each piece has been counted.

There are two points which should be emphasized, both of which have a strong bearing on the accuracy of an inventory.

1. A monthly reconciliation should be made of each store with the balance as shown on the auditor's books. This is quite similar to a bank balance. The auditor prepares a monthly statement showing all debits and credits entered on the general books affecting a particular store. The storekeeper prepares a similar statement showing what he has debited and credited his store. These statements are checked one against the other, and all items which cannot be checked as appearing on the auditor's statement and not on the storekeepers' and vice versa, are shown on the reconciliation statement as a debit or credit as the case may be. By making this statement monthly, all errors whether made by the auditor or storekeeper are adjusted. Experience with this monthly reconciliation has demonstrated the fact that many storekeepers have been severely criticized for differences which in reality did not exist, but were the result of errors in the auditing department.

2. If we are to have good inventories, not only proper preparation must be made and instructions followed, but our storekeepers must appreciate their responsibilities as to proper accounting, ordering, disbursing and care of the thousands of material dollars of which they are custodians.

Public Relations from the Woman's Standpoint

Report of the Public Relations from the Woman's Standpoint Subcommittee, Women's Public Information Committee.*

IN addition to the subject of "informing" the women within the public utility organizations, it was felt this year that the work of the Women's Public Information Committee of the P.C.E.A. profitably could include the problem of telling the public utility story to the woman in the home.

At least one-half of the public is feminine, with a voting power equivalent to that of the male members of society and an influence which is at any rate considerable. From the standpoint of the problem of public relations, it may be remarked that the service of electricity to the home is in large measure a service to women and if it does not represent the bulk of power generated nor the greatest source of revenue to the company, it at least affects the most numerous clientele. If, again, it is the man who pays most of the bills, it is the woman in at least many cases who draws the check which goes to pay for the electricity in the home and it is out of her allowance that this item must come—in consequence it is she who notes the amount of the bill with a jealous eye and is ready to complain if she thinks the charge exhorbitant. It is further the woman who is inconvenienced if anything goes wrong with the domestic service and she who is benefited if all runs smoothly. She it is who makes the majority of purchases of electricity consuming devices which go into the home and upon her rests the decision as to how much they shall be employed. And so, although it is as a rule the husband's name which appears on the books and although the masculine voice may resound the loudest at times of public upheaval, the woman is not to be overlooked.

This factor of feminine influence in the shaping of public opinion has not been overlooked in the past. Many of the policies and much of the effort which have gone into the cementing of satisfactory public relations have been directed toward the public as a whole and have included the women as well as the men in their scope. Customer ownership, good will advertising, courtesy and a high ideal of service on the part of employees—these meet the problem of the woman as well as the man. In addition most companies have directed their attention to some extent to the women individually. But the problem of public relations has not been solved and although, of course, in the nature of life and the public, it never can be, there remain many conditions to be bettered.

This present paper is an attempt to look at the question from the woman's standpoint. It is a discussion of what has been done rather than what needs doing, to reach the woman as a factor in public relations. With the thought that the record of what one company has done with success may prove stimulating reading to another, a questionnaire covering the various phases of public relations work as specifically directed toward the woman of the community was sent out to the power companies of the Pacific Coast Electrical Association. Responses were received from the following companies:

The Southern Sierras Power Company.
San Diego Consolidated Gas & Electric Company.
San Joaquin Light & Power Corporation.
Los Angeles Gas & Electric Corporation.

*Clotilde Grunsky, McGraw-Hill Company, chairman; Bertha J. Dale, Pacific Gas and Electric Company; Helen A. Rogers, The Southern Sierras Power Company.

Fig. 1—An exhibit booth of the Pacific Gas and Electric Company which was particularly directed to the woman consumer

Coast Valleys Gas & Electric Company.
Coast Counties Gas & Electric Company.
Western States Gas & Electric Company.
The California Oregon Power Company.
Truckee River Power Company.
Pacific Gas and Electric Company.
Tucson Gas Electric Light & Power Company.
Great Western Power Company.
Desert Power & Water Company.
The Arizona Power Company.
Southern California Edison Company.

Some of the answers of especial interest are here summarized:

Home Economics Department

It was felt by the committee that the development of an adequate home economics department within the company might be of considerable value in developing good will among women customers. The answers to the questionnaires indicated that most of the companies employed one or more women demonstrators, the number varying from one to seven. Four of the companies maintained kitchens for demonstration and exhibit purposes and one reports that such a kitchen is in the process of construction. Five companies conduct cooking schools, either in conjunction with local newspapers or alone and one or two of the other companies state that they cooperate in such work with the manufacturers.

The Great Western Power Company has a demonstrating kitchen in the San Francisco office where demonstrations have been presentel in the form of electrically cooked dinners given to special groups from the various ladies' clubs, Parent Teachers Associations, domestic science instructors and the like. It is estimated that approximately 150 visitors a month come into the office to ask information and witness demonstrations by the attendant who is always on hand.

The San Joaquin Light & Power Corporation, in addition to giving demonstrations in the home, has for the past several years furnished a demonstration before the annual meeting of the Parlor Lecture Club of Fresno and to women's clubs in other parts of the territories, using all-electric appliances to make the demonstration. These were made at the request of the clubs.

Similar work of demonstrations in the home and before women's clubs is carried on by the Coast Counties Gas & Electric Company, the San Diego Consolidated Gas & Electric Company and the Pacific Gas and Electric Company.

The Southern Sierras Power Company has no demonstrators, but every range user is visited periodically by the salesmen and home demonstrations are given on request. Through this personal contact the women are also acquainted with the fact that club programs of this nature will be available if desired.

For the past four years, the Southern California Edison Company and the Los Angeles Gas & Electric Corporation, in conjunction with the electrical jobbers and mancufacturers of Los Angeles, have maintained an electrical display in the Home Economics Department of the Los Angeles Evening Express under the supervision of Mrs. Kate Brew-Vaughn, director of that department. A demonstrator is also maintained whose duty it is at all times to explain and demonstrate the various electrical appliances. Mrs. Vaughn, through her department invites women's clubs, church societies and the public in general to lectures, demonstrations, cooking schools, china painting school, talks on the care of babies, home nursing and a great many other similar activities, resulting in an average attendance of 6,000 in a month's time. Mrs. Vaughn also has carried out cooking schools in the outlying towns under the auspices of the local women's clubs. These last from one to three days and as a rule have shown to capacity houses.

Demonstrating is done in stores by the Pacific Gas and Electric Company and others have cooperated with manufacturers in pressing special campaigns.

No company reports anything which could be called a domestic science laboratory, where experiments and tests can be carried out. Such an institution would be designed not particularly to solve the problems of the electrical manufacturers, (although if improvements in electrical equipment could be suggested they would certainly increase the use of the appliance), but rather to solve the household problems which arise in connection with the use of equipment. Such laboratories are maintained by a number of the women's magazines and by one or two of the larger eastern power companies and from them emanate suggestions helpful to women in cooking, washing, cleaning and the thousand and one duties of the household. Thousands of requests for information come into the household economics department of such a magazine as Good Housekeeping every month and the data sent out by mail in response is greater than the amount of information which finds its way into the pages of the magazine.

Why should not the housewife look to the power company instead of the woman's magazine to give her information in regard to the use of her electric equipment? Such assistance would enable her to make more effective use of electricity and hence not only increase her consumption, but lead to very kindly feelings be-

Fig. 2—The day nursery for children which was the contribution of the San Joaquin Light & Power Corporation to the Fresno Fair.

tween herself and the company. Is there not the possibility here for an information service which would be built up by means of advertising and through the personal contact of salesmen and demonstrators? The head of such a laboratory would be available for programs before women's clubs and domestic science classes in the schools, she might conduct an educational half hour over the radio, she would send out articles and written matter through channels of the press and through company publications, by mail or personal distribution. This is a suggestion which presents itself as worthy of further discussion.

Advertising and Publications

Most of the companies do a certain amount of advertising which can be classified as good will advertising and among this is usually represented the subject of electricity in the home.

One of the most interesting experiments reported in this line is a series of advertisements run by the Los Angeles Gas & Electric Corporation designed to make their service and the contact which their employees have with the public better understood. Among these are several addressed directly to women, notably those on the economical use of gas and electricity, the explanation of higher bills in summer, the problems of meter reading and the handling of meters which get out of order. These advertisements are signed by the head of the particular department in question and are accompanied by his picture so that the message has a personal ring. In addition they are couched in simple, direct language, entirely without the cant of the "be-thankful-to-the nice power-company" order.

The Pacific Gas and Electric Company and The California Oregon Power Company both submit advertisements emphasizing the convenience brought about by the use of electricity in the home.

Recipe books are given out by most of the companies in conjunction with range sales and by those who conduct cooking schools there is generally some literature distributed at this time.

The Tucson Gas, Electric Light & Power Company sends out recipes and other helpful information for housewives with their monthly bills, using material furnished by foodstuff and electric appliance advertisers in this way, as well as that from the N.E.L.A. and The Society for Electrical Development.

The California Oregon Power Company uses the small monthly bulletin "The Volt" which is sent to all consumers to carry a good will message, occasionally directing this especially to women.

Waffle iron recipes are sent out by the Valley Electrical Supply Company on postcards and are used in small folder form. In addition an occasional announcement used as an enclosure with bills or in connection with advertising calls attention to the free repair service on cords or some other such features of the store.

The Los Angeles Gas & Electric Corporation sends out a booklet descriptive of the company, containing a blank for subscriptiion to stock, and also a folder entitled "Gas Talk" which gives pointers on the efficient use of gas. This does not cover electricity, however.

This same idea is applied to both gas and electricity by the Pacific Gas and Electric Company in its "Service Manual" which is intended to give an understanding of the proper handling of the simpler problems of using modern substitutes for fuel. This is furnished any consumer on request.

The Pacific Gas and Electric Company also utilizes the small newspaper "P. G. & E. Progress" to interest and serve its women consumers. This is issued monthly and one page is devoted to "Helps for the Homemaker." Two prizes of $10 each are offered each month for the best suggestions sent in by housewives on the subject of the use or care of gas and electric equipment respectively, in addition to which a payment of $2 is made for every suggestion from a reader which is printed in the magazine. As originally planned the page was general in scope, but it has changed to cover a specific subject each time, such as "wash day problems" or "planning the home," with the idea that a better type of material will be elicited in this way. Good advice on these subjects will also be included by experts from within the company. A large number of entries is made to each contest and much interest has been shown among the women consumers of the company. The replies also indicate the apparent ignorance and the need for further information on these subjects in the average home.

Fairs and Community Occasions

Practically all of the companies large enough to carry on any activity of this kind presented exhibits at fairs and assisted whenever the event was one of importance by supplying gas and electric equipment free of charge as a form of advertising.

The Los Angeles Gas & Electric Corporation has had success with the type of booth in community industrial exhibits in which the right and wrong methods of using stoves is demonstrated, the adjustment of burners shown and other object lessons taught. Literature covering similar lessons is also distributed.


5 P. G. and E. Progress

Helps for the Homemaker

January Prize Winner

DO YOU know how to clean your piano so that it will not be infested with moths? Mr. Robert B. Affleck of 3000 Brook street, Oakland, suggests that perfect cleanliness can be attained by an intelligent use of the electric vacuum cleaner. Here is her contribution which wins the $10 prize for January.

Use Your Electric Heater To Warm Breakfast Dishes

In spite of our delight in our small electric range we have sometimes regretted of a cold morning that we have no warming closet to heat the breakfast dishes. I have found an adequate substitute in my electric heater. I assemble the dishes upon a tray and place the heater so that the heat is turned directly upon them, although at a sufficient distance so as not to injure them. It takes only a few minutes to bring them to the desired warmth.—Mrs. George Thorp, box 280, Patterson.

Waffle Toast Has a Lot And a Flavor All Its Own

Make Electric Percolator Warm Milk for the Baby

When the baby needs a bottle at night the usual method is for the mother to rise and heat the milk on the gas stove. I have found a great convenience in the electric percolator, which can be attached to the outlet beside the bed.

This House... Clothes F...

Ten Dollars for Ideas

TEN DOLLARS is offered each month for the best new household idea submitted by a reader of this page, which has to do with the care or use of gas and electric equipment. The award is made on the basis of the value of the idea, without regard to ...ary merit of the contribution.

The Electrical Brownie

Messengers at Your Service

...help You ...sting of Gas

...shing Machine Motor Does ...Good Job Polishing Eggs

Fig. 3—Considerable interest is shown by housekeepers in the monthly contest which is a regular feature of "P. G. & E. Progress." A sample of the electrical brownie stories for children is also shown. It is hoped to get the children to reading this feature regularly and so to carry the educational message to the parents as well as themselves

The Coast Valleys Gas & Electric Company makes a particular effort to cooperate with Farm Bureau meetings and county fairs, where the value of electricity in the home is the theme demonstrated. Demonstration booths are also a feature of the Pacific Gas and Electric Company displays and are designed to call attention to the general service of the company as well as to make sales.

An institution worthy of particular attention is the Free Day Nursery which has been a feature of the San Joaquin Light & Power Corporation's exhibit at the Fresno District Fair. This was combined with a rest room, a children's playground and an emergency hospital. In addition a miniature exhibit of the company's power development was displayed.

The playground was covered with 8-in. of clean white sand with buckets, shovels, balls, wheel barrows and a teeter-totter which kept the children busy. Two attendants were on duty here, although at time of great rush, as many as five were kept occupied. Two trained nurses took charge of the infant's department where cots and baskets were provided. A physician in charge directed the care of the little ones and in addition cared for any emergency cases. Milk was kept in an electric refrigerator heated in an electric milk warmer and regular meals furnished. Five hundred children and 117 infants were cared for during the six days of the fair. In connection with the day nursery, a first aid

station handled fifty-eight cases of various types of injuries from a sliver in the finger to serious injuries on the race track. Nine lost children turned over to the nursery by the police were restored to their parents in one day.

Three fat puppies, a cage of cooing ring doves, a bear and a combination cage of a dog and a monkey furnished entertainment for the children as well as the grown-ups and the miniature power house was always surrounded by a crowd. Anything so much needed at a country fair was bound to be appreciated and it was felt that this was a very effective builder of good will, particularly among the mothers.

Women's Clubs

Few of the companies report any effort to encourage their women employees to join women's clubs, although one or two state that they would be very glad to have their girls join if they so desire.

The San Joaquin Light & Power Corporation is now undertaking to encourage their employees in this way. The Coast Valleys Gas & Electric Company reports that nearly 100 per cent of its women employees belong to outside organizations, although dues are not paid by the company. Two companies report paying the dues of employees in women's clubs, the Pacific Gas and Electric Company and the Southern California Edison Company, both of which state that women in their employ are encouraged to join women's clubs and the dues of a reasonable number are paid.

In regard to programs available for women's clubs, it appears that such are available in the form of cooking demonstrations in the case of the large majority of the companies. A regular organized program service is provided by the Pacific Gas and Electric Company, the availability of such programs being made known to the clubs through the local divisional organizations.

In view of the importance of personal contacts in cementing friendships and the encouragement given the men of the organization to join such groups as the Rotary and other such clubs, it would seem that in general this opportunity among the women of the community had been overlooked. Practically all women's clubs have some sort of study programs and in so far as these concern household problems, or civic problems, the power company representative should have something of value to contribute. More important than any such specific benefit, however, is the friendly feeling which is passed on from the club member to the organization she represents. It would seem advisable that the women in the power company employ be encouraged to join outside organizations and so far as is appropriate, the dues of a reasonable number are paid.

A more definite system of calling the attention of club presidents and program chairmen to the availability of programs would result probably in a more general presentation of the power company story. A woman's committee, including members of the women's clubs probably could be of assistance here.

Reaching the Children

The importance of reaching the children with the electrical story has been recognized by quite a number of the companies. Viewed from the angle of the child alone, this practice has perhaps no appropriate place in this discussion. But inasmuch as the girl of the present becomes the woman and housewife of tomorrow, this is truly a form of women's public relations work. Furthermore the story told the child is carried home and there discussed, often receiving more attention than information received direct.

With the thought of taking advantage of this indirect interest, the San Joaquin Light & Power Corporation has used a series of nursery rhymes centering about the uses of electricity and attractively illustrated as part of their advertising.

Similarly, the Pacific Gas and Electric Company has run a series of short educational stories in the "P. G. & E. Progress" relating the adventures of the electrical brownie. These are illustrated and carry the story of the same characters through many adventures. Children are consistent fans and once they become interested will insist on following the "funnies" or the particular bedtime story with which they are acquainted. It is hoped to increase the attention given the publication in this way, as well as to convey lessons in electricity to parents and children alike in palatable form.

Many of the companies have contact with the children through the public schools. In San Diego a special course for girls is given in "Applied Electricity," which includes the reading of electric meters, the replacing of fuses and the repairing of cords.

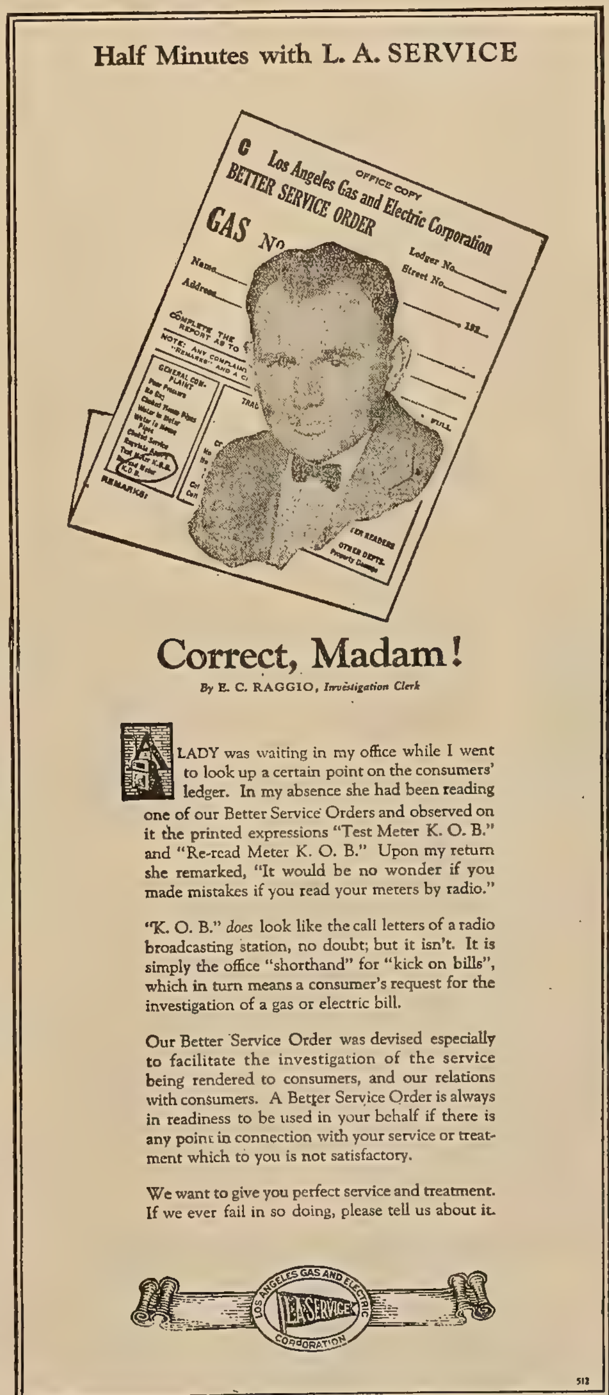

Fig. 4—A sample of advertising aimed to build good will among women consumers

The Southern Sierras Power Company has conducted groups of school children through the company's office during office hours, with the idea that they would thus obtain an idea of the magnitude of the service at their command when they press an electric light button. Demonstrations are made by this company and others before the teachers of the home economics department, with the idea that the same message will later be carried to the children.

The San Joaquin Light & Power Corporation pays some attention to children in their fair exhibits. One demonstration which attracted much interest included the baking of biscuits on a toy range before an envious and admiring audience.

The recent Home Lighting Contest of course was participated in by all the power companies and offers an

example of how the home can be reached through the children of the family.

Conclusion

The woman as a rule regards electricity primarily from the standpoint of its service in the home. Her attitude toward the power company will not be unfriendly if she feels that (1) those who deal with her are courteous (2) that her bills are not exorbitant (3) her requests for service are promptly and efficiently handled. Like anyone else, if she owns some of the stock in the company; if she understands how electricity is manufactured and how the company is run; if she knows personally and likes some of the individuals which belong to the company; if the company has helped her solve her problems; she will have an active feeling of interest in its welfare. Some of the methods by which the various Pacific Coast power companies endeavor to bring about this friendly attitude have here been outlined.

CRISP ELECTRIC GINGER BISCUIT

½ cup butter.
1 cup sugar.
½ sour cream or milk.
2 eggs.
1 tablespoon ginger.
1 teaspoon soda.
1 teaspoon cinnamon.
2½ cups sifted flour.
Juice and rind (grated rind) of 1 orange

Cream butter and sugar. Add beaten eggs Sift flour, cinnamon and ginger together and add alternately with sour milk in which soda has been dissolved, to the mixture. Add orange. Drop by spoonfuls on waffle iron and bake three minutes.

VALLEY ELECTRICAL SUPPLY CO.
PHONE 3397 FRESNO SAN JOAQUIN POWER BLDG.

Fig. 5—Waffle iron recipes are passed out in conjunction with programs given before women's clubs by the San Joaquin Light & Power Corporation

In addition to the work already being done, the committee would recommend a further study of the possibilities in the following fields:

1. A home economics laboratory.
2. An information service on household problems.
3. Reaching the housewife by means of the radio.
4. Encouragement of women employees to join outside clubs.
5. Further organization to present the story of electricity before women's clubs.

Talks have been given in many of the schools in their territory by the various district managers of the Southern California Edison Company and electrical motion pictures have been shown.

A composite picture of the children of stockholders run in the little publication "Edison Partners," it was felt made much good will on the part of parents. Extra copies of the group were run off on heavy paper and sent to all who had a child represented in the picture.

Activities of the Women Within the Organization

Report of the Women's Activities within the Organization Subcommittee, Women's Public Information Committee*

FOR many years the women in the organization have been very active in all lines of endeavor, although not organized as a working unit. Realizing that women's work is a vital element in the industries a movement has been inaugurated to co-ordinate the work of the women in the public utilities of the nation. Following are interesting reports of some of the work being done by our organizations:

The Southern Sierras Power Company women for many years have been carrying on educational work in connection with their Power Club organization. This consists of talks on important features of their company's work and motion pictures of educational value. Aside from this to further accident prevention, the women have organized a first-aid class composed of two teams.

* Mrs. N. G. Letchworth, San Joaquin Light & Power Corporation, chairman.

It will be interesting to know that the women of the Coast Valleys Gas & Electric Company have put out their first company paper, which is in the form of a four-page bulletin giving the up-to-the-minute office news. They also have meetings once a month and have chosen for their educational course, work of the various departments. Their instructors are the department heads. This has proved very satisfactory.

The women of the Western States Gas & Electric Company are following up the same lines of educational work, going a step further by making visits to the gas plant and becoming acquainted with the manufacture of gas.

The women employees of the San Diego Consolidated Gas & Electric Company also have had the privilege of being taken through the gas plant and the electric stations and being instructed on gas production by the superintendent. In the near future, in their new building, they expect to conduct regular cooking demonstrations by electricity and gas. They expect to be privileged to hear lectures on company methods by members of the various departments.

The Pacific Gas and Electric Company women employees always have been very active through their employees' association. They have a Women's Affairs Committee in each of the sections. The chairman of the central committee is located in San Francisco and all of the activities are carried on under her guidance, although the social affairs in each section are taken care of through the local chairman and her committee. This committee looks after the welfare of the women as to proper lunch and rest rooms. The athletic work consists of swimming, basket ball and gymnasium work, and is handled by taking out membership in the Y.W.C.A. This is of great assistance in keeping the women interested in the organization. Aside from this they take an active part with the men on the Benefit and Loan Committee, visiting the sick and needy and furnishing them with many comforts. They also have accomplished much good in the way of entertaining the disabled soldiers at the Letterman General Hospital at Christmas time. The girls have also been active in all of the stock companies.

The women of the San Joaquin Light & Power Corporation and subsidiary companies—Valley Electrical Supply Company; Fresno City Water Corporation; and Midland Counties Public Service Corporation—have always been active in many lines of endeavor. They have taken part in all civic drives for all community betterment such as: movement for Y.W.C.A. building; Community Chest; and others of similar import. There are a number of individuals having memberships in the local Y.W.C.A.; Business and Professional Women's Club, and in Fresno, one of the women is a member of the W.Y.C.A. Board. In the San Joaquin Power Club, an employee organization which has a branch in every district, the women are active members, working generally on committees and hold various offices. In the Mutual Benefit Organization, which is sponsored by the Power Club, the women take an active part, a proportionate number serving on the Board of Managers. Various forms of welfare work are undertaken by individuals and departments.

The management has put on an extensive educational course under the tutorship of the various heads of departments, the meetings being held once a week at night, for a period of eight weeks. This course has been open to women and a large number have taken advantage of it. The subjects covered are as follows:

I History and policy.
II Elementary electricity.
III Finance and stock sales.
IV Regulations and rate fixing.
V Rates, rules and regulations.
VI Salesmanship.
VII Publicity and advertising.
VIII Organization and operation of departments.

One of the most recent activities of the women of this company is the organization of a luncheon club, the initial meeting of the Fresno branch being attended by more than 100. They have outlined an extensive program of social and educational interests for these affairs and expect very soon to have a club in each district. The Fresno branch has adopted an unique method of financing their club, that of securing the agency for a household cleanser which nets them a good profit. Each member of the club proves her sales ability in disposing of the goods. As a consequence, the finances of the club are assured.

NEWS OF THE INDUSTRY

No Agreement Reached on Hetch Hetchy Power Disposal

No agreement has been reached in the matter of the temporary disposal of the output of the city of San Francisco's Moccasin Plant. The citizens' advisory committee appointed to negotiate with officials of the Pacific Gas and Electric Company (Journal of Electricity, April 15, 1925, p. 294), was unable to come to any agreement for the distribution of the power with the company, according to a report presented May 26.

The utility company offered the city $2,000,000 a year for the 420,000,000-kw-hr. output of the plant. The advisory committee proposed a plan by which the power might be distributed over the lines of the company, the power to be sold at present legal rates and bills to be collected and accounted for by the power company. The company was to receive a stipulated compensation or a fixed price per unit of power, the compensation to be determined by the California Railroad Commission.

The city's power plant is nearing completion but its transmission line ends at Newark, about 35 miles from San Francisco, and the city has no distribution system. Mayor Rolph has announced that the special committee appointed by the Board of Supervisors, headed by himself, will take the matter in hand and find a satisfactory solution.

Denver Voters Refuse Utility Franchise Renewal

At the municipal election held in Denver May 19 the people rejected by a vote of 30,842 to 15,834 the proposed franchise renewal asked by the Public Service Company of Colorado. (Journal of Electricity, May 1, 1925, p. 340.) With the exception of a few scattered precincts the average vote throughout the city was two to one against the measure.

Accompanying the franchise in defeat was a similar measure submitted by the Denver Tramway Company asking permission to establish and operate motor bus lines in the city as a supplement to street railway service. A $10,000,000 bond issue for the municipal water plant was also defeated.

With a fifty-fifty split in the selection of elective officers and with the rejection of all measures submitted on separate ballots, there is a general feeling in Denver, it is reported, that the election represented a wave of conservatism rather than extreme objection to any particular measure.

The Public Service Company's franchise in Denver still has another year to run and it is likely, though not certain, that the franchise renewal again will be requested in the meantime. One of the principal offers of the Public Service Company in the new franchise was a reduction of rates effective June 1. With the franchise defeated these will not go into effect, the subsequent saving to the company being estimated at more than a quarter of a million dollars.

Colorado River Waterworks Plan on Los Angeles Ballot

The voters of Los Angeles will be asked to vote at the municipal election to be held June 2 on a $2,000,000 bond issue "for the acquisition, construction and completion by the city of Los Angeles of a certain revenue-producing municipal improvement, to-wit: waterworks, including the acquisition of necessary lands and rights-of-way and the construction of tunnels, canals, conduits and other necessary works in connection with an aqueduct system for obtaining an additional water supply for said city and its inhabitants from the Colorado River."

This proposition, if indorsed, it is believed, will constitute the first move in the campaign of Los Angeles water and power advocates for the construction of the Bouder Canyon dam and the consequent generation of power on the Colorado River for distribution to southern California municipalities.

Puget Sound Company to Reduce Rates for Rural Service

Simultaneously with the opening of the new 40,000-hp. hydroelectric plant at Baker River about Sept. 1, of this year, the Puget Sound Power & Light Company, Seattle, will reduce its residence and commercial lighting rates throughout the territory outside of Seattle, according to A. W. Leonard, president of the company. The reduction will be one-half cent per kw-hr. applied directly to the primary rate. The aggregate saving to company customers will amount to more than $150,000 a year, company officials announce.

The rate reduction has been coupled with the completion of the Baker River project for the reason that, when electric power from that source becomes available, the expense of operating steam generating plants at many of the principal centers will no longer be necessary, and the company plans to share the savings to be effected with its customers in the form of lower rates. With the completion of new transmission lines and various interconnections effected some time ago, the Baker River electric power can be transmitted into almost every part of western Washington.

Another important factor in the reduction, the company states, is the increased use of electric service by the average residence customer, resulting largely from the use of numerous labor-saving appliances in the home.

The new rate schedules will be filed at Olympia in the near future for approval by the Washington Department of Public Works.

Guests' Entertainment Provided in Convention Plans

During the hours when business sessions are not being held, visitors to San Francisco for the forty-eighth convention of the National Electric Light Association, June 15-19, will find a wide choice of entertainment provided for them. Features for these lighter hours will include golf, tennis, dancing, cabaret entertainment, music, tours, boat trips, and especially for the ladies card parties and teas.

The annual president's reception will be held on Monday evening, June 15. It will be followed by a formal ball. Both the reception and ball will take place at the Fairmont Hotel.

Fifteen or sixteen golf courses in and adjacent to the San Francisco Bay area will be available to the delegates. The big golf days will be Friday afternoon, June 19, and Saturday, June 20, after the business sessions have been completed. Plans also are being made to enable guests arriving early to play golf on Saturday afternoon, June 13, and Sunday, June 14. The golf committee, under the chairmanship of A. F. Hockenbeamer, will maintain a booth at the Exposition Auditorium to enable those wishing to play to sign up for matches. Golf privileges will be extended throughout the duration of the convention.

Many tours and inspection trips will be available. It is planned that before and after the convention sessions, trips will be arranged to various hydroelectric properties in California, as well as a number of shorter trips to give an indication of rural electrification on the Pacific Coast and some of the latest technical developments.

Dancing and entertainment will be carried on in the various hotels and cafes for which San Francisco is noted in such a manner as not to interfere with the business program of the convention.

On Friday afternoon following the closing business session a boat trip will be held on San Francisco Bay. An electrically propelled boat of the Key System Transit Company, will be used, affording delegates the opportunity of seeing the Golden Gate, various islands in the bay and industrial developments. R. E. Fisher is chairman of the entertainment committee.

Power Resources of Blue River Surveyed.—Following a survey of the power resources of the Blue River in Colorado, about 70 miles west of Denver, E. E. Jones, hydraulic engineer of the Geological Survey, has prepared a report on the power possibilities of that river. The report states that six sites were found between Breckinridge and the mouth of the river with a capacity, with the existing flow, of 22,000 hp. for 50 per cent of the time and 12,000 hp. for 90 per cent of the time.

Tentative Program for Forty-Eighth N.E.L.A. Convention Announced

A tentative program covering the forty-eighth convention of the National Electric Light Association, to be held in San Francisco June 15-19, has been prepared by association headquarters. The program may be changed slightly prior to the convention, but in general covers the activities during the annual meeting.

The tentative arrangement is as follows:

GENERAL SESSIONS

FRANKLIN T. GRIFFITH, chairman.
J. E. DAVIDSON, vice-chairman.

First General Session

Tuesday, June 16, 9:30 a.m.
Meeting Room, Main Auditorium

Address, "Welcome to California," F. W. Richardson, Governor of California, Sacramento, Calif.

Address, President Franklin T. Griffith, Portland Electric Power Co., Portland, Ore.

Appointment, Committee on President's Address.

Report, Treasurer W. A. Jones, Henry L. Doherty & Co., New York, N. Y.

Report, Finance Committee, Jos. B. McCall, chairman, The Philadelphia Electric Co., Philadelphia, Pa.

Report, Managing Director M. H. Aylesworth.

Report, Constitution and By-Laws Committee, W. C. L. Eglin, chairman, The Pheladelphia Electric Co., Philadelphia, Pa.

Election, Constitutional Revision Committee.

Report, Public Relations National Section, M. S. Sloan, chairman, Brooklyn Edison Co., Inc., Brooklyn, N. Y.

Report, Accounting National Section, W. Paxton Little, chairman, The Niagara Falls Power Co., Niagara Falls, N. Y.

Report, Commercial National Section, W. R. Putnam, chairman, Idaho Power Co., Boise, Idaho.

Report, Technical National Section, H. P. Liversidge, chairman, The Philadelphia Electric Co., Philadelphia, Pa.

Address, Colonel William Kelly, director of engineering, National Electric Light Association.

Election, Nominating Committee.

Second General Session

Wednesday, June 17, 9:30 a.m.
Meeting Room, Main Auditorium

Announcement, Memorials Committee.

Announcement, Resolutions Committee.

Report, Educational Committee, Fred R. Jenkins, chairman, Commonwealth Edison Co., Chicago, Ill.

Report, Lamp Committee, Frank W. Smith, chairman, The United Electric Light & Power Co., New York, N. Y.

Report, Electrification of Steam Railroads Committee, Frank R. Coates, chairman, Henry L. Doherty & Co., New York, N. Y.

Address, "The Necessity of Moving On," Paul Shoup, president, Southern Pacific Railroad Co., San Francisco, Calif.

Address, Honorable W. D. B. Ainey, president, National Association of Railway and Utilities Commissioners, Harrisburg, Pa.

Address, F. A. Wilson-Lawrenson, publisher, Hearst's Atlanta Georgia, Atlanta, Ga.

Third General Session

Thursday, June 18, 9:30 a.m.
Meeting Room, Main Auditorium

Report, Prize Awards Committee, W. H. Onken, Jr., Secretary, Electrical World, New York, N. Y.

Report, Lighting Educational Committee, J. E. Davidson, chairman, Nebraska Power Co., Omaha, Neb.

Address, Miss Julia Groo, first prize winner in Home Lighting Contest, Portland, Ore.

Report, Membership Committee, Howard K. Mohr, chairman, The Philadelphia Electric Co., Philadelphia, Pa.

Report, Water Power Development Committee, W. E. Creed, chairman, Pacific Gas and Electric Co., San Francisco, Calif.

Report, Rural Electric Service Committee, G. C. Neff, chairman, Wisconsin Power, Light & Heat Co., Madison, Wis.

Report, Relation of Electricity to Agriculture Committee, E. A. White, director, Chicago, Ill.

Address, Honorable William M. Jardine, secretary, Department of Agriculture, Washington, D. C.

Address, L. J. Tabor, Master, National Grange, Columbus, Ohio.

Fourth General Session

Friday, June 19, 9:30 a.m.
Meeting Room, Main Auditorium

Report, Wiring Committee, R. S. Hale, chairman, The Edison Electric Illuminating Co., Boston, Mass.

Report, United States Chamber of Commerce National Industrial Conference Board, John W. Lieb, N.E.L.A. representative, The New York Edison Co., New York, N. Y.

Report, Rate Research Committee, Alex Dow, chairman, The Detroit Edison Co., Detroit, Mich.

Address, "What Electricity Is Doing for Women," Mrs. John D. Sherman, president, General Federation of Women's Clubs, Washington, D. C.

Report, Insurance Committee, Charles B. Scott, chairman, Bureau of Safety, Chicago, Ill.

Report, Contact Committee, Department of Commerce, George H. Harries, chairman, H. M. Byllesby & Co., Chicago, Ill.

Report, Memorials Committee, W. H. Onken, Jr., chairman, Electrical World, New York, N. Y.

Report, Committee on President's Address.

Report, Constitutional Revision Committee.

Vote, Constitutional Amendments Proposed.

Report, Resolutions Committee.

Report, Nominating Committee.

Election, Officers and Members Executive Committee.

Adjournment.

PUBLIC POLICY COMMITTEE SESSION

MARTIN J. INSULL, chairman.

Wednesday, June 17, 8:30 p.m.
Meeting Room, Main Auditorium

Organ Recital.

Session called to order.

Report, Public Policy Committee, Martin J. Insull, chairman, Middle West Utilities Co., Chicago, Ill.

Solo (artist to be announced).

Address, Honorable Herbert Hoover, secretary, Department of Commerce, Washington, D. C.

Solo (artist to be announced).

Report, Charles A. Coffin Prize Committee, Franklin T. Griffith, chairman, Portland Electric Power Co., Portland, Ore.

Award, Charles A. Coffin Medal.

Adjournment.

PUBLIC RELATIONS NATIONAL SECTION

M. S. SLOAN, chairman
H. C. ABELL, vice-chairman
E. A. BARROWS, vice-chairman
W. H. McGRATH, vice-chairman

First Session

Tuesday, June 16, 2:30 p.m.
Meeting Room, Main Auditorium

Address, Chairman, Public Relations National Section, M. S. Sloan, Brooklyn Edison Co., Inc., Brooklyn, N. Y.

Announcement, Nominating Committee.

Report, Advertising Survey Committee, Joseph B. Groce, chairman, the Edison Electric Illuminating Co., Boston, Mass.

Report, Cooperation with Educational Institutions Committee, John C. Parker, chairman, Brooklyn Edison Co., Inc., Brooklyn, N. Y.

Report, Industrial Relations Committee, Homer E. Niesz, chairman, Commonwealth Edison Co., Chicago, Ill.

Report, Manufacturers Advertising Committee, J. C. McQuiston, chairman, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

Report, Public Speaking Committee, W. S. Vivian, chairman, Middle West Utilities Co., Chicago, Ill.

Report, Uniformity of State Regulatory Laws Committee, W. W. Freeman, chairman, the Union Gas & Electric Co., Cincinnati, Ohio.

Second Session

Wednesday, June 17, 2:30 p.m.
Meeting Room, Main Auditorium

Report, Women's Public Information Committee, Miss R. E. McKee, chairman, Middle West Utilities Co., Chicago, Ill.

Discussion, led by the chairman of the Women's Public Information Committees of the Geographic Divisions.

Canadian—Mrs. L. Magnus. Eastern—Miss Clara Zillesson. East Central—Mrs. F. A. Tate. Great Lakes—Mrs. P. W. Evans. Middle West—Miss Isabelle Davie. New England—Miss Gertrude Thibodeau. North Central—Mrs. R. G. Thompson. Northwest—Mrs. L. A. McArthur. Pacific Coast—Miss Frances Emans. Rocky Mountain—Miss Inez Thompson. Southeastern—Miss Ruth Morrison. Southwestern—Mrs. Florence D. Horn.

Report, Information Bureau Organizations Committee, H. C. Abell, chairman, Electric Bond & Share Co., New York, N. Y.

Discussion, led by Charles L. Edgar, chairman, New England Bureau of Public Service Information.

Bernard J. Mullaney, director, Illinois Committee on Public Utility Information.

Discussion by the Directors of the State Public Utility Information Bureaus.

Alabama—Leon C. Bradley. Arkansas—Earle W. Hodges. Connecticut—Clarence G. Willard. Florida—R. J. Holly. Georgia—Willard Cope. Illinois—Hal M. Lytle. Indiana—John C. Mellett. Iowa—J. Carmichael.. Kansas—H. Lee Jones. Kentucky—E. F. Kelley. Louisiana-Mississippi—Hugh M. Blain. Michigan—Alfred Fischer. Missouri—J. B. Sheridan. Nebraska—Horace M. Davis. New England Div.—Samuel T. McQuarrie. New Jersey—J. S. S. Richardson. New York—F. W. Crone. North and South Carolina—S. E. Boney. Ohio—Ben. E. Ling. Oklahoma—Edward F. McKay. Oregon—W. P. Strandborg. Pennsylvania—J. S. S. Richardson. Rocky Mountain Div.—George E. Lewis. Tennessee — Ross Murphy. Texas — George McQuaid. Washington—E. H. Thomas. West Virginia—A. Bliss McCrum. Wisconsin—A. F. Herwig.

Third Session

Thursday, June 18, 2:30 p.m.
Meeting Room, Main Auditorium

Report, Nominating Committee.

Report, Customer Ownership Committee, A. Emory Wishon, chairman, San Joaquin Light & Power Corporation, Fresno, Calif.

Report, Relations with Financial Institutions Committee, M. S. Sloan, chairman, Brooklyn Edison Co., Inc., Brooklyn, N. Y.

Symposium, "Electric Light and Power Company Finance," B. C. Forbes, editor, Hearst's Publications, New York, N. Y.; Sidney Z. Mitchell, president, Electric Bond & Share Co., New York, N. Y.; Alfred L. Loomis, vice-president, Bonbright & Co., Inc., New York, N. Y.; Martin J. Insull, president, Middle West Utilities Co., Chicago, Ill.

Adjournment.

ACCOUNTING NATIONAL SECTION

W. PAXTON LITTLE, chairman.
WALTER C. LANG, vice-chairman
A. R. PATTERSON, vice-chairman
C. M. BREITINGER, vice-chairman

First Session

Tuesday, June 16, 2:30 p.m.
Meeting Room No. 4

Address, Chairman, Accounting National Section, W. Paxton Little, The Niagara Falls Power Co., Niagara Falls, N. Y.

Announcement, Nominating Committee.

Report, Budget Committee, Robert B. Grove, chairman, The United Electric Light & Power Co., New York, N. Y.

Report, Classification of Accounts and Annual Reports Committee, W. J. Meyers, chairman, The United Electric Light & Power Co., New York, N. Y.

Report, Customers' Records and Billing Methods Committee, W. H. Cassell, chairman, Consolidated Gas, Electric Light & Power Co., Baltimore, Md.

Report, Filing and Preservation of Records Committee, Franklyn Heydecke, chairman, Public Service Electric & Gas Co., Newark, N. J.

Report, Fixed Capital Records Committee, G. U. Stewart, chairman, The Philadelphia Electric Co., Philadelphia, Pa.

Report, Payroll Standardization Committee, W. J. Vega, chairman, The New York Edison Co., New York, N. Y.

Report, Purchasing and Storeroom Accounting Committee, K. C. Campbell, chairman, The Detroit Edison Co., Detroit, Mich.

Report, Security Accounting Committee, T. A. Wallace, chairman, Henry L. Doherty & Co., New York, N. Y.

Adjournment.

Second Session

Wednesday, June 17, 2:30 p.m.
Meeting Room No. 4

Report, Nominating Committee.

Address, speaker and title to be announced.

Address, "Indispensable," P. S. Arkwright, president, Georgia Railway & Power Co., Atlanta, Ga.

Address, W. R. Putnam, chairman, Commercial National Section, Idaho Power Co., Boise, Idaho.

Address, M. S. Sloan, chairman, Public Relations National Section, Brooklyn Edison Co., Inc., Brooklyn, N. Y.

Address, H. P. Liversidge, chairman, Technical National Section, The Philadelphia Electric Co., Philadelphia, Pa.

Address, "The Accountant's Relation to Rate Cases," H. M. Brundage, vice-president, The Empire State Gas & Electric Association, New York, N. Y.

Address, "Scope of Activities of the Accounting National Section," H. M. Edwards, vice-president, The New York Edison Co., New York, N. Y.

Adjournment.

COMMERCIAL NATIONAL SECTION

W. R. PUTNAM, chairman
F. D. PEMBLETON, vice-chairman
GEORGE H. JONES, vice-chairman

First Session

Tuesday, June 16, 2:30 p.m.
Meeting Room No. 3

Address, Chairman, Commercial National Section, W. R. Putnam, Idaho Power Co., Boise, Idaho.

Announcement, Nominating Committee.

Report, Industrial Lighting Committee, Joseph F. Becker, chairman, The United Electric Light & Power Co., New York, N. Y.

Report, Electric Cooking and Heating Committee, A. C. McMicken, chairman, Portland Electric Power Co., Portland, Ore.

Address, "Merchandising Electrical Appliances," Edward N. Hurley, chairman, Board of Directors, Hurley Machine Co., Chicago, Ill.

Report, Appliance Committee, Thomas W. Berger, chairman, The Philadelphia Electric Co., Philadelphia, Pa.

Second Session

Wednesday, June 17, 2:30 p.m.
Meeting Room No. 3

Report, Customer Relations Committee, F. F. Kellogg, chairman, Duquesne Light Co., Pittsburgh, Pa.

Report, Electric Refrigeration Committee, G. E. Miller, chairman, the Cleveland Electric Illuminating Co., Cleveland, Ohio.

Report, Power Committee, V. M. F. Tallman, chairman, Charles H. Tenney & Co., Boston, Mass.

Address, speaker representing Power Committee.

Third Session

Thursday, June 18, 2:30 p.m.
Meeting Room No. 3

Report, Nominating Committee.

Report, Transportation Committee, B. J. Martin, chairman, Commonwealth Edison Co., Chicago, Ill.

Report, Street and Highway Lighting Committee, E. W. Lloyd, chairman, Commonwealth Edison Co., Chicago, Ill.

Report, Lighting Committee, C. C. Munroe, chairman, the Detroit Edison Co., Detroit, Mich.

Adjournment.

TECHNICAL NATIONAL SECTION

H. P. LIVERSIDGE, chairman
C. F. HIRSHFELD, vice-chairman
L. M. KLAUBER, vice-chairman
W. K. VANDERPOEL, vice-chairman

First Session

Thursday, June 16, 2:30 p.m.
Meeting Room No. 2

Address, Chairman, Technical National Section, H. P. Liversidge, The Philadelphia Electric Co., Philadelphia, Pa.

Announcement, Nominating Committee.

Report, Accident Prevention Committee, Charles B. Scott, chairman, Bureau of Safety, Chicago, Ill.

Report, Electrical Apparatus Committee, A. A. Meyer, chairman, The Detroit Edison Co., Detroit, Mich.

Report, Hydraulic Power Committee, R. L. Hearn, chairman, The Washington Water Power Co., Spokane, Wash.

Report, Inductive Co-ordination Committee, H. S. Phelps, chairman, The Philadelphia Electric Co., Philadelphia, Pa.

Report, Meter Committee, B. Currier, chairman, The Philadelphia Electric Co., Philadelphia, Pa.

Report, Prime Movers Committee, Nicholas Stahl, chairman, Narragansett Electric Lighting Co., Providence, R. I.

Report, Overhead Systems Committee, W. G. Kelley, chairman, Commonwealth Edison Co., Chicago, Ill.

Report, Underground Systems Committee, W. H. Cole, chairman, The Edison Electric Illuminating Co., Boston, Mass.

Second Session

Wednesday, June 17, 2:30 p.m.
Meeting Room No. 2

Address, "Some Factors Affecting the Relation of Steam and Water Power in Combined Systems," Herbert A. Barre, executive engineer, Southern California Edison Co., Los Angeles, Calif.

Address, "Special Features in Western Turbine and Water Wheel Design," Ely C. Hutchinson, vice-president, The Pelton Water Wheel Co., San Francisco, Calif.

Address, speaker to be announced.

Third Session

Thursday, June 18, 2:30 p.m.
Meeting Room No. 2

Report, Nominating Committee.

Address, "The Spirit which Permeates the Service of Our Utilities," H. Birchard Taylor, vice-president, Wm. Cramp & Sons Ship and Engine Building Co., Philadelphia, Pa.

Address, "The Status of the Engineer," R. F. Pack, vice-president, National Electric Light Association, Minneapolis, Minn.

Address, "The Engineer as a Factor in Human Affairs," William F. Durand, president, American Society of Mechanical Engineers, Brooklyn, N. Y.

Adjournment.

James H. McGraw Offers Four Annual Awards for Electrical Men

To encourage individual initiative and creative thinking among electrical men, James H. McGraw has established four annual awards, three to be competed for by the men of the manufacturing, jobbing and contractor-dealer branches of the electrical industry respectively, and the fourth to be open, in addition, to the men of the central station industry.

The awards will be presented in the first three instances to that man in each field who is judged to have made the most important personal contribution to improvement or progress in the advancement of either the processes or practices or policies of manufacturing, jobbing, contracting or merchandising. A fourth award will be given to that electrical man in any of the four branches of the industry who has contributed the most valuable and useful idea for promoting cooperation between any two or more branches of the electrical industry.

No separate award is made to men of the central station industry exclusively, in deference to the fact that this field is already covered by the James H. McGraw prize and other annual awards, presented each year at the convention of the National Electric Light Association.

Each award will take the form of a bronze medal and a purse of one hundred dollars in gold. The Society for Electrical Development has been requested to act as sponsor for these awards, and appoint a committee of awards which will prepare an appropriate medal and conduct the contests.

The Manufacturers' Medal

Each year on the occasion of the meeting of either the Associated Manufacturers of Electrical Supplies or the Electric Power Club, a medal and a purse of one hundred dollars will be awarded to that employee or official of any manufacturing organization of the United States or Canada, who during the preceding year made the most constructive contribution to the commercial development of the electrical manufacturing industry through the suggestion of an idea that has been successfully applied to the product, the promotion of the market or the improvement of service. The medal and the purse will be awarded by the prize jury to that man whose submitted statement, endorsed by an executive of his organization, appeals to the judges as offering the greatest value to the electrical manufacturing industry.

The Jobbers' Medal

Each year on the occasion of the meeting of the Electrical Supply Jobbers Association, a medal and a purse of one hundred dollars will be awarded to that employee or official of any electrical supply jobbing house of the United States or Canada, who during preceding year made the most constructive contribution to the commercial development of the electrical jobbing industry, through the suggestion of an idea that has been successfully applied in the promotion of the market or the improvement of jobber service. The medal and the purse will be awarded by the prize jury to that man whose submitted statement, endorsed by an executive of his organization, appeals to the judges as offering the greatest value to the jobbing industry.

The Contractor-Dealers' Medal

Each year on the occasion of the meeting of the Association of Electragists-International, a medal and a purse of one hundred dollars will be awarded to the employee or official of any electrical contractor-dealer, contractor or dealer, of the United States or Canada, who during the preceding year made the most constructive contribution to the commercial development of the electrical contractor-dealer industry through the suggestion of an idea that has been successfully applied to raising the quality standard or adequacy of wiring installations, the promotion of the market or the improvement of service in the installation or merchandising of electrical materials, equipment or appliances. The medal and the purse will be awarded by the prize jury to that man whose submitted statement, endorsed by an executive of his company or any recognized electrical jobber with whom he deals, appeals to the judges as offering the greatest value to the electrical contractor-dealer industry.

The Medal for Cooperation

The medal for cooperation and purse of one hundred dollars will be awarded each year on the occasion of a special dinner meeting of representatives of all branches of the electrical industry to be arranged by the directors of the Society for Electrical Development at an appropriate time coinciding with a meeting of its board of directors, to that electrical man, an employee or official of any electrical manufacturing, jobbing, central station or contractor-dealer organization of the United States or Canada who during the preceding year made the most constructive contribution to the promotion of cooperation and harmony between any two or more of the different branches of the electrical industry. The medal and purse will be awarded by the prize jury to that man whose submittted statement endorsed by an executive of his organization appeals to the judges as offering an idea promising the best influence for the upbuilding of a common understanding and unity of interest among the four major groups of the electrical industry or to the improvement of the inter-relations between any two or more groups.

Purpose of Awards

Every year men of the electrical industry, through individual enterprise and personal enthusiasm, are contributing ideas that benefit the whole electrical business. These contributions are gladly and freely given in the course of the day's work. They receive no public recognition. Yet were there some established time, place and method for the reviewing of these personal achievements it would provide a graceful acknowledgment and a gratifying reward that would encourage and stimulate the entire personnel of the industry to more active thinking for the advancement of the industry and the service of the public.

To this end these awards have been instituted in the hope and belief that they may bring inspiration and added zeal, particularly to the younger employees who will be the electrical executive of tomorrow. The award is open to men of all departments of the specified branches of the industry under the conditions set forth below:

The awards have three objectives—

1. To give public recognition and reward for ideas which have been contributed to the common good by individuals of the electrical industry.
2. To give publicity to these ideas that they may have wider application and employment.
3. To stimulate and encourage electrical men to think constructively for the broad improvement of the electrical industry and to carry through the ideas that occur to them.

Nature of Competitions

The natural question is—What sort of a contribution should qualify under the McGraw Awards? This is after all not difficult to define. It may be most simply characterized, perhaps, as any new idea which any employee or official of any electrical manufacturing, jobbing or contractor-dealer organization may conceive, devise, suggest and apply to improve the methods of his branch of the industry. This may originate in any department of the business. It may be some radical benefit to stock or store keeping practice, a better way to carry out the accounting, credit or estimating function, a productive innovation in handling men or jobs; in cataloging or pricing goods, in packing, shipping or delivery, or in methods of advertising, selling or administration. The test of every case, however, will be this—Has the contribution of this idea been a constructive service to the commercial advancement of the electrical industry, in any branch or as a whole? By this it will be judged.

In the case of the medal for cooperation the award may be made for any new idea which any electrical man may conceive and introduce to improve cooperation between electrical manufacturers, jobbers, central station men and contractor-dealers, either in their personal contacts and relationships within a community or in their organized local, state, regional or national activities, wherein their interests join and harmony of purpose and policy promotes the general welfare of the industry.

Eligibility

Any employee of any house that is recognized by the judges as belonging to the branch or branches of the electrical industry competing for the award shall be eligible for this award. Each contestant must submit with his paper a letter from an executive officer of his company endorsing his statement or from some other executive recognized as of the electrical industry and in position to testify in the matter.

Form of Application

Each contestant must submit the record of his contribution in a statement presenting a full description of the idea and its application, typewritten on one side of paper only.

Judging the Awards

Entries for the four awards will be judged by juries of five men who will be appointed as follows—

For the Manufacturers' Medal—Four judges to be appointed by the Electrical Manufacturers' Council and one by Mr. McGraw.

For the Jobbers' Medal—Four judges to be appointed by the Electrical Supply Jobbers Association and one by Mr. McGraw.

For the Contractor-Dealers' Medal—Four judges to be appointed by the Association of Electragists-International and one by Mr. McGraw.

The Medal for Cooperation—Four judges to be appointed by the Society for Electrical Development from its board of directors, one each from the groups representing the four branches of the electrical industry, and one by Mr. McGraw.

In the event that no contribution submitted in any one of the contests should be considered worthy, the judges are empowered to make no presentation of that award that year.

Date of Awards

The first competition for these four McGraw Awards will close on Sept. 1, 1925. Candidates must submit their statements not later than this date, addressed to The James H. McGraw Awards, in care of the Society for Electrical Development, 522 Fifth Avenue, New York City. Subsequent awards will be presented annually at a date to be announced. The first presentations will be made as follows—

The manufacturers' medal and the purse in November at the winter meeting of either the Associated Manufacturers of Electrical Supplies, or the Electric Power Club, depending upon whether the recipient of the award is connected with the supply or apparatus end of the manufacturing industry. Subsequent awards will be presented annually at the regular summer convention of either the Associated Manufacturers of Electrical Supplies or the Electric Power Club.

The jobbers' medal and the purse in November during the winter meeting of the Electrical Supply Jobbers Association. Subsequent awards will be presented annually, at the regular summer convention of the Electrical Supply Jobbers Association.

The contractor-dealer medal and the purse in September during the fall meeting of the Association of Electragists-International. Subsequent awards will be presented annually at the regular fall convention of this association.

The medal for cooperation and the purse during the autumn at a time to be announced later coincident with the fall meeting of the directors of the Society for Electrical Development. Subsequent awards will be presented annually about the same time.

Information

Any man of the electrical industry who feels in doubt as to whether a certain idea or service rendered in the interest of either the manufacturing jobbing or contractor-dealer branch of the electrical industry or to promote cooperation between industry groups is applicable or eligible for entry for the award, is invited to communicate directly to The James H. McGraw Awards, in care of the Society for Electrical Development, 522 Fifth Avenue, New York City, where information and advice will be gladly given.

The personnel of the committee of awards, appointed by The Society for Electrical Development, is as follows: W. W. Freeman, president Union Gas & Electric Company, Cincinnati, Ohio; H. B. Crouse, president Crouse-Hinds Company, Syracuse, N. Y.; W. E. Robertson, vice-president Robertson Cataract Electric Company, Buffalo, N. Y.; L. K. Comstock, president L. K. Comstock & Company, New York; F. M. Feiker, vice-president The Society for Electrical Development; Earl E. Whitehorne, commercial editor, Electrical World.

Trophy Awarded in Los Angeles Jobbers' Bowling League

Concluding the season for the Los Angeles electrical jobbers' bowling league, the members of the league gathered at the weekly meeting of the Electric Club of that city on May 18 and presented to the Reiman Wholesale Electric Company the cup donated by Jensen's Bowling Alleys. The cup is to be a perpetual trophy. Eighteen matches, from which a possible 72 points were attainable, were played by the teams entered in the league, and the winning team attained a score of 48 out of the possible 72. The winning team was made up of L. E. Clarke, J. G. Marks, E. Nellor, Ray Stanek, M. Michell and E. Ritzmiller.

Silver cup won by Reiman Wholesale Electric Company team in Los Angeles jobbers' bowling league tournament

Second place honors were divided by the teams of the Graham Reynolds Electric Company and the Western Light & Fixture Company with a total of 42 points won. The standing of the other teams, with number of points won is as follows: (fourth) tie between Western Electric Company and Manufacturers' Agents, 36; (sixth) Illinois Electric Company, 34; (seventh) Electric Corporation, 33; (eighth) Pacific States Electric Company, 31; (ninth) Myers Electric Supply Company, 30; (tenth) Listenwalter & Gough, 28.

The bowling league was organized by the jobbers in Los Angeles in December of last year.' (Journal of Electricity, April 1, p. 267.) Nine jobbing houses entered teams, and seven manufacturers' agents combined to form the tenth team of the league. During the season two sets of prizes were awarded each week, one for high series and the other for high game.

It is the intention of J. A. Sines, Chicago Fuse Manufacturing Company, to organize a similar league next year, inviting all branches of the electrical industry to enter teams. Mr. Sines organized the jobbers' league and acted as secretary-treasurer of the organization. The matter of an all-electrical league has been discussed at the Electric Club.

Washington Utility Sells 350 Ranges in Sales Campaign

A six-weeks sales campaign on Hotpoint electric ranges recently was conducted by The Washington Water Power Company, Spokane, and, while complete returns have not yet been received, indications are that the total of electric ranges and water heaters sold will reach 350. This will bring the grand total of electric ranges installed on the lines of The Washington Water Power Company to approximately 6,500.

In appreciation of their efforts a dinner was tendered the members of the sales department of the power company by W. E. Durant, Spokane representative of the Edison Electric Appliance Company, Inc. Twenty-eight members of the power company's organization were present, including J. E. E. Royer, assistant general manager; Lewis A. Lewis, sales manager; R. B. McElroy, assistant sales manager; and J. F. Farquhar, general agent. The dinner was prepared and served in the model kitchen at the general office of the power company by Miss L. Carol Dangler, special demonstrator of the Edison Electric Appliance Company, Inc., and Miss Agnes Sweeney, home economist of the central station. Miss Dangler, who cooperated with the power company during the campaign, was presented with a traveling correspondence set by Carl Hoffman of the sales department.

Free Distribution to Be Made of Surplus Primers

The Lighting Educational Committee has decided to distribute its surplus stock of Home Lighting Primers, free of charge. These primers contain the latest information on better home lighting and can be distributed to the public, especially in districts where only a portion of the people received these Primers through their children.

Orders for any quantity can be made as long as the stock lasts and all orders will be sent express collect. Companies or persons desiring these Primers should communicate with The Lighting Educational Committee, 680 Fifth Avenue, New York City.

New Unit Added to Elko, B. C., Plant.—The East Kootenay Power Company has added another 7,500-hp. unit to its plant at Elko, B. C., bringing the total capacity of its plant up to 22,500 hp. The company has duplicated 100 miles of its 250-mile high-tension line with a steel core aluminum cable that is said to have a capacity of double the original line. A fire at the company's plant, caused by a short circuit, recently destroyed two generators.

Meetings

Registration for Convention to Start June 13

For the convenience of delegates to the N.E.L.A. convention who arrive early, the registration committee has made preparations to accept registrations on June 13 and 14 prior to the official opening of the convention. Registration booths in the San Francisco Exposition Auditorium will be open from 12 noon to 5 p.m. on June 13 and from 10 a.m. to 4 p.m. on June 14.

This early registration will be for the benefit of early arrivals and also will minimize the congestion at the booths during the registration on Monday. The committee has requested that all those who can, register on one of the days prior to the official opening of the convention.

Annual Convention Utah A.A.E. Held in Provo, May 2

The annual state convention of the Utah chapter of the American Association of Engineers was held at Provo, Utah, May 2. Approximately fifty engineers from various parts of Utah were in attendance, including many of the electrical branch of the profession.

They were welcomed to Provo by Mayor O. K. Hansen. Frank Deming, president of the Provo chapter, extended greetings and on behalf of the local members of the association bade the visitors welcome. C. J. Ulrich presided at the convention.

W. M. Green, of the U. S. Bureau of Reclamation, presented a paper on the Salt Lake Basin project. He stated that the next step in the development of this project will be the formation of associations through which the work can be carried on with success. He described some of the proposed storage and irrigation features of the project, and pointed out some of its benefits.

A survey of the development of the Bear River hydroelectric plants of the Utah Power & Light Company formed the subject of an interesting paper by J. R. Jarvis, division engineer of the Ogden district of that company. Mr. Jarvis described the company's system of equalization of stream flow and water storage, and featured in his discussion the functions of the great Bear Lake storage reservoir in providing an uninterupted supply of electric service.

Rocky Mountain N.E.L.A. Meeting Plans Being Formulated

Definite plans for the annual joint convention of the Rocky Mountain division N. E. L. A. and the Colorado Public Service Association at Glenwood Springs, Colo., Sept. 14-17, have been announced by E. A. Phinney, general manager of the Jefferson County Power & Light Company, who has been designated as general convention chairman by the heads of the two organizations.

The convention this year will be one day longer than has been the practice for over twenty years, and business sessions will be held in the morning instead of twice a day as hertofore. This arrangement, according to the chairman, will provide more time for sports and outside entertainment and at the same time will insure greater interest and attendance at the longer daily sessions.

Entertainment features which proved so popular at the convention last year are to be arranged by the committee, which will have Mr. and Mrs. John J. Cooper of Denver at its head. Other members of the entertainment committee are: G. E. Lewis, Rocky Mountain Committee on Public Utility Information; J. E. Loiseau, Public Service Company of Colorado; J. E. Moorhead, Mountain States Telephone & Telegraph Company; and B. C. J. Wheatlake, General Electric Company.

Chairmen of the other committees which have been appointed are as follows: program committee—O. A. Weller, Public Service Company of Colorado; publicity committee—F. F. McCammon, Public Service Company of Colorado; transportation committee—C. C. Johnson, Mountain States Telephone & Telegraph Company.

The convention will be held at the Hotel Colorado, as has been the practice in previous years.

COMING EVENTS

Electrical Supply Jobbers' Association—
Annual Convention—Hot Springs, Va.
June 1-6, 1925

Associated Manufacturers of Electrical Supplies—
Annual Meeting—Hot Springs, Va.
June 8-13, 1925

Electric Truck School—
Pacific Gas and Electric Company Building, San Francisco
June 8-13, 1925

Industrial Electric Heating School—
Pacific Gas and Electric Company Building, San Francisco
June 9-13, 1925

Northwest Electric Light and Power Association—Annual Convention —
Gasco Building, Portland, Ore.
June 12, 1925

Pacific Coast Electrical Association—
Annual Meeting—San Francisco, Calif.
June 15, 1925

National Electric Light Association—
Annual Convention—San Francisco, Calif.
June 15-19, 1925

Jobbers Hold Quarterly Meeting at Santa Barbara

Discussion of credit relations of the electrical jobber and dealer formed the principal part of the open meeting held in connection with the quarterly meeting of the Pacific Coast Electrical Supply Jobbers' Association held at Santa Barbara, Calif., May 7-9. The Electrical Credit Men's Association conducted parallel sessions. Closed sessions were conducted in the Hotel Arlington during the morning and afternoon hours of the three days, the open meeting being held on the evening of the last day. The meeting was opened by Rudolph Holterman, vice-president and general manager of the Fobes Supply Company, San Francisco, and chairman of the association. Mr. Holterman turned the meeting over to S. W. Murray, credit manager of the Illinois Electric Company, Los Angeles, who acted as chairman of the evening.

J. G. Marks, of the Reiman Wholesale Electric Company of Los Angeles, delivered a paper on "Credit Cheaters," during the course of which he brought out an interesting thought concerning the advisability of concentration of purchases rather than diversification. Mr. Marks' theory was that in the case of dealers placing their orders with comparatively few jobbers in larger amounts the interest and assistance of the jobber would be proportionately greater. This would work to the advantage of the dealer in case at any time he should find himself in difficulties of any nature.

Mr. Marks spoke of the advantage that had accrued to the contractor situation in Los Angeles on account of the city ruling requiring registration of contractors, a $1,000 bond and $100 annual tax. This, according to Mr. Marks, has reduced the number of contractors in that city nearly 50 per cent. The indiscriminate extension of credits is very detrimental to the industry, in fact many are now insisting upon the establishment of a rule by which no credit is granted unless the application is accompanied by a financial statement supplemented by quarterly statements thereafter. It was stated that the city of Los Angeles produces more small business failures than any other large city, a condition which better organization and cooperation would help to correct.

Fred P. Vose, secretary and treasurer of the National Electrical Credit Association of Chicago, delivered an interesting extemporaneous address in which he said, among other things, that business conditions generally were spotted, good and bad alternately. Referring to credits, he brought out the fact that the usual inquiry, How much do you owe? has been supplemented by a question equally important, How many do you owe? In his opinion better service from the jobber would result if the dealer concentrated his purchases and increased the volume. It is desirable, according to Mr. Vose, that a greater sympathetic interest should exist between the salesman and the credit man. He spoke of the advisability of the credit man making periodical trips through the territory with the salesmen by which he could familiarize himself at first hand with the conditions under which the dealer is operating.

A high tribute was paid to the so-called Milwaukee system by which, through cooperation between the jobbers and contractors, a system of auditing and accounting helps was furnished to the contractor by the jobber, bringing about better accounting methods and more accurate information for the dealer concerning his cost of doing business.

On the lighter side of the meeting, the East Indian festivities preceding the customary golf tournament met with an enthusiastic response. The auctioneer was Phil Gough of Listenwalter & Gough, Los Angeles. Newton Graham of the Graham-Reynolds Electric Company, Los Angeles, carried away the first prize with a comfortable margin to spare. T. E. Bibbins was second, Garnett Young third, Phil Gough fourth, E. P. Markee fifth, Ray W. Murphy sixth, Clarence Thompson seventh, Charles Goodman eighth, R. M. Alvord ninth, and Fred Mills tenth. R. M. Alvord acted as toastmaster at the golf dinner.

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IN THE ELEVEN WESTERN STATES

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IN THE ELEVEN WESTERN STATES

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New York to San Francisco in Fourteen Minutes

SINCE this issue of the Journal is devoted primarily to progress in the electrical sciences in celebration of the forty-eighth annual convention of the National Electric Light Association in San Francisco, attention is directed to the front-cover advertisement of the Wagner Electric Corporation embodying a unique use of the opportunity afforded by that latest scientific marvel, the telephotograph.

The total elapsed time between the sending and the receiving of the copy for this advertisement from the offices of Ray D. Lillibridge, Incorporated, New York City, to the Journal in San Francisco, was just 14 minutes —7 minutes for each negative.

This novel idea had its inception with the Lillibridge company; the N.E.L.A. Convention furnished the inspiration; and to the Journal has been accorded the distinction of publishing the first front-cover advertisement for which the copy has been transmitted by this method.

It is peculiarly fitting that electrical progress should be typified through the genius and enterprise of the American Telephone and Telegraph Company on an occasion such as this. Truly it would seem that we merely are entering into the dawn of an era of scientific achievement that will make the last hundred years seem as no more than the mere preparation of a foundation.

"What next?" is the question.

EDITORIAL

Welcome N. E. L. A.

WELCOME, members of the National Electric Light Association, welcome to San Francisco, the Pacific Coast and the West! Although on several past occasions it has been the privilege of Western cities to entertain the N.E.L.A., this is the first time since the Panama-Pacific Exposition that San Francisco has been accorded that honor, an honor of which every citizen is justly proud.

IN considering the tradition built up by a background of hundreds of years about the great cities of the Atlantic Coast, or of the thousands of years behind the cities of the old world, it would seem trite to refer to the mere span of some seventy-seven years that have elapsed since the discovery of gold in California by Marshall in 1848 as history, yet, in actual accomplishment contributing to the economic welfare and social happiness of its citizens, San Francisco has done its bit, and more.

IT is a far cry from the cradle and Long Tom of the placer miner, the covered wagon of the Argonauts of 1849, the hectic days of the vigilantes, and the adventurous episodes chronicled by Bret Harte and Mark Twain, to the modern city that has risen from the ashes of the great disaster of April 18, 1906. Nevertheless, in the courage and fortitude that have built this city, equipped it with every convenience and device known to modern science, is found an example of what we are pleased to regard as the best of American character.

HERE is a land, developed first by those responding to the lure of gold, whose descendants have stayed and found in the countless other natural resources a veritable storehouse filled with riches bounteously bestowed by Nature. Each year, as development progresses farther and farther, new wealth is added, and the prospects of Californians in general and San Franciscans in particular become greater and greater in opportunity for useful service.

AND of all these opportunities, what is greater than electricity? It enters into the daily lives of millions of people, not merely the urban population, but the suburban and rural as well, and this to a degree not paralleled anywhere else in the world.

HERE in California is a physiographic situation unique in its peculiar adaptability to the development of electricity and its practically universal application to the nth degree. The great central valleys of the Sacramento and the San Joaquin take the form of a great elongated oval, enclosed by the Coast Range and Sierra Nevada. These mountains are vast storehouses for the winter snows and provide catchment areas admirably adapted to water storage and its application to hydroelectric power development. The concentration of urban population at the seacoast necessitates the transmission of electrical energy two hundred miles and more, the lines traversing the great central valleys where agriculture prevails, thus bringing right to the door of the farmer the blessing of electrical service in no less degree than that afforded to the city dweller.

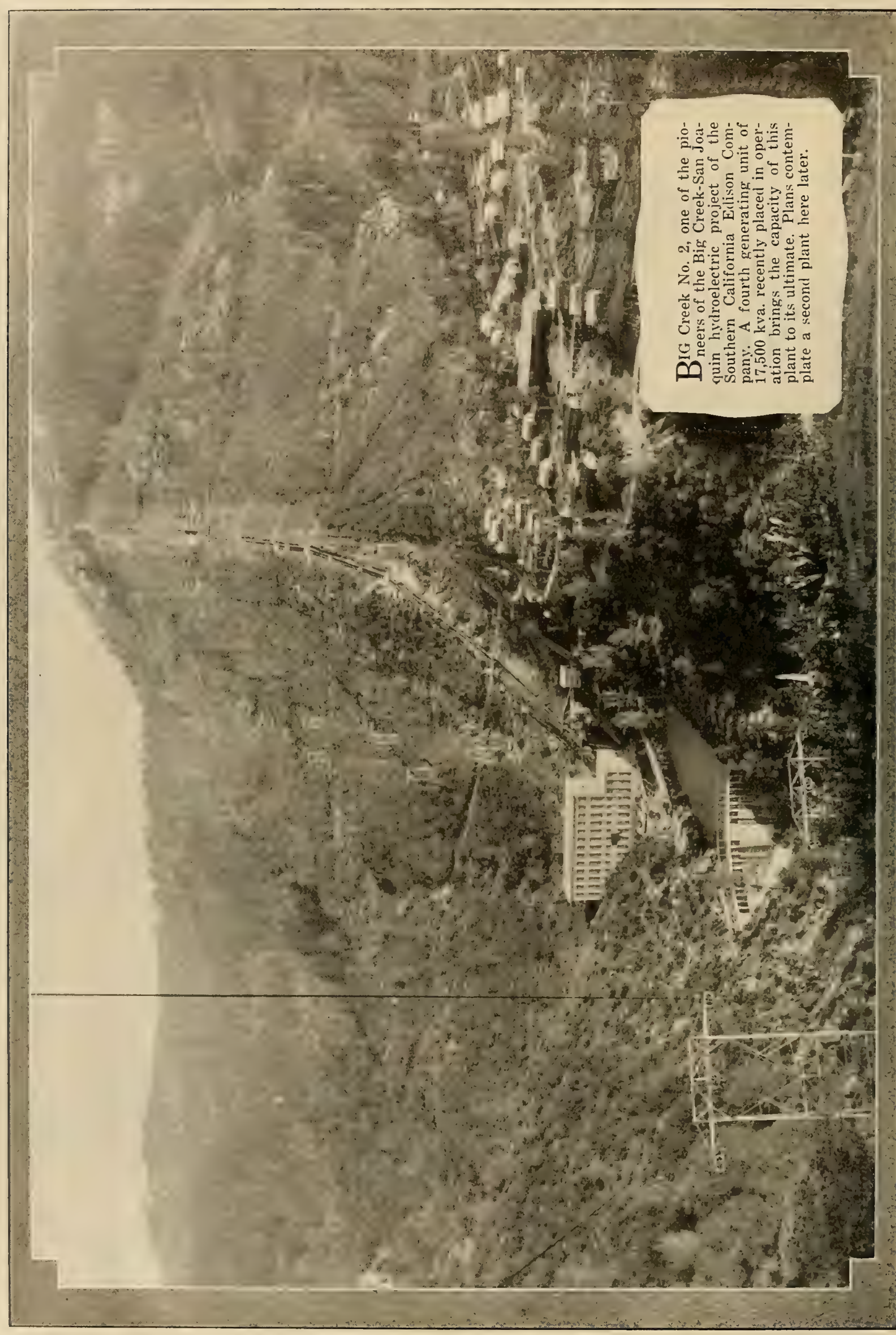
THERE is no coal; fuel oil is costly and at other disadvantages compared to electricity. Is it any wonder that California leads the world in the consumption of electricity per capita for every class of application and for every class of consumer?

CONDITIONS affecting the design of apparatus and the transmission of electricity are unique in this state; thus a practice peculiar to California and the West has been developed. To the discussion of these local peculiarities this issue of the Journal of Electricity has been devoted.

IN a few words, from a technical standpoint California has contributed to the world of electricity the greatest example of interconnected power transmission systems in the United States, the development of high-head hydroelectric power, the Pelton impulse turbine, and high-tension power transmission up to 220 kilovolts; from an economic and social standpoint, the inception of the so-called "customer-ownership" idea by which through the purchase of utility stocks on the broadest possible plan of distribution, true public ownership without sacrifice of private initiative and efficiency in operation has become an accomplished fact.

STUDIES of these interesting developments are set forth in this issue. They have been prepared especially for the edification of the members of the National Electric Light Association, in the hope that the data set forth may be of practical benefit to them in helping to solve their own problems.

THE electrical industry of San Francisco, of California, and of the entire West extends a hearty welcome to its guests, and bids them Godspeed in the pursuit of their objective—the constant improvement of electrical service and its continued extension throughout the land.



BIG Creek No. 2, one of the pioneers of the Big Creek-San Joaquin hydroelectric project of the Southern California Edison Company. A fourth generating unit of 17,500 kva. recently placed in operation brings the capacity of this plant to its ultimate. Plans contemplate a second plant here later.

What the N. E. L. A. Convention Means to the Pacific Coast

By Franklin T. Griffith
President National Electric Light Association

THE convention of the National Electric Light Association to be held in San Francisco, June 15-19, presents opportunities for the further development and progress of the electrical industry on the Pacific Coast which we, who are so closely identified with it, should not overlook. In turn, we may, perhaps with pardonable pride, express the conviction that our eastern brethren in the industry will undoubtedly find here on the Coast many things worthy of their deepest study.

Franklin T. Griffith

As delegates to this convention, will come many distinguished visitors who are not only the recognized leaders in the electrical industry but who also are identified with widespread commercial and industrial activities throughout the United States. The gospel which we as hosts convey to these gentlemen will be spread effectively and widely over the entire country. We may well now pause and take note of the potential possibilties of our Pacific Coast states and be prepared to proclaim them properly.

Our Pacific Coast states abound in opportunities for further developments in agriculture, timber, industry and commerce. Favorable climatic conditions, abundance of natural resources, the greatest supply of potential hydroelectric power in the country, adequate transportation facilities by rail, water and magnificent state highway systems, all are factors which, present in abundance in this vast empire, must of necessity make for great opportunities and progress in all fields of endeavor. Let us demonstrate and proclaim these factors at this fitting opportunity. The returns will come back to us manyfold. We know it to be an established fact that the East is looking to the West for attractive capital outlets, and it is to our vital interest to enable these gentlemen to get acquainted with every substantial resource this Pacific Coast affords, to the end that they may be equipped to advise their business, financial and industrial associates in the East of what the Far West has to offer.

The progress made in developing the electrical industry here on the Coast in the past ten years is indeed worthy of attention and study by our eastern brethern and they will, no doubt, find much here to inspire and direct their future efforts. Here they will find hydroelectric developments which in the vastness of their extent and the technical details of their accomplishments are nowhere excelled. They will find the latest pioneering in laboratory and field in the high-voltage transmission of electrical energy and the most comprehensive and extensive interconnection of transmission networks. They will find the widest distribution and utilization of electricity in urban, suburban and rural districts of any territory in the country.

The Pacific Coast early became the cradle of a widespread and vicious movement toward municipal and state ownership of public utilities. Here this movement gained its strongest foothold and it is indeed appropriate that here should arise the most effective plan for its defeat. I refer to the customer-ownership plan which, initiated eleven years ago, has now gained such headway that on three recent and notable occasions, two in California and one in Washington, public ownership was dealt a blow at the polls from which its recovery will be long delayed.

The convention of the National Electric Light Association at San Francisco thus presents opportunities of mutual benefit to the East and West. Let us of the West not overlook these opportunities and above all let us not fail in our pleasures and obligations as hosts.

Hydroelectric Construction and Progress to Meet Growing Power Demand

By W. D. Shaw
Southern California Edis on Company, Los Angeles

WHILE the Southern California Edison Company has sixteen water-power plants totaling over 75,000 kw. and independent of its Big Creek system, it is this latter network of hydroelectric plants that has commanded the attention of the world. That this should be true is not hard to understand when one stops to consider the gigantic magnitude of the ultimate development, the daring and untried engineering procedure which has since become standard practice and the increase and success of this system since its inauguration.

As is well known, the Big Creek system derives its name from a tributary of the San Joaquin River. The first two power plants known as Big Creek No. 1 and No. 2 are located on this stream about seventy-five miles northeast of Fresno and were built in 1913. Two 30,000-kw. generators were installed initially in each power house, but at the present time Big Creek No. 1 has a total of 78,000 kw. and Big Creek No. 2 a total of 70,000 kw.

In order to supply and control the water necessary for these two power plants, a reservoir known as Huntington Lake was constructed. This lake has a capacity of 88,000 acre-ft., is 4.5 miles long by 0.75 mile wide and is fed by a drainage area of 79 sq. miles.

As the market for the power to be generated was 240 miles distant and as this was beyond the limit at which power economically could be transmitted at the voltages then in use, it was necessary to blaze the way and go to untried voltages and engineering methods. The pressure selected was 150 kv. and synchronous condensers were installed to maintain a constant voltage. Needless to say, both experiments proved successful and history was made in the art of electrical transmission.

After the completion of this first installation, extensive studies were made and a comprehensive plan outlined for the ultimate development of what is now the Big Creek system. Present plans show that an ultimate of about 1,100,000 kw. can be obtained and will call for the buildiing of a score of power houses fed by more than a dozen reservoirs capable of storing a total of nearly 750,000 acre-ft. This would conserve the water from a drainage area of over 1,200 sq. miles.

Consistent with this general program, the next station to be built would have been Big Creek No. 3 which, by means of impulse wheels, could have utilized a drop of 1,545 ft. after the water left Big Creek No. 2. However, due to the extreme urgency for power in 1920, it was decided to take advantage of about one-half of this head by means of reaction turbines and complete a power plant known as Big Creek No. 8. This was done in the record time of fifteen months and a single unit of 22,500 kw. was installed.

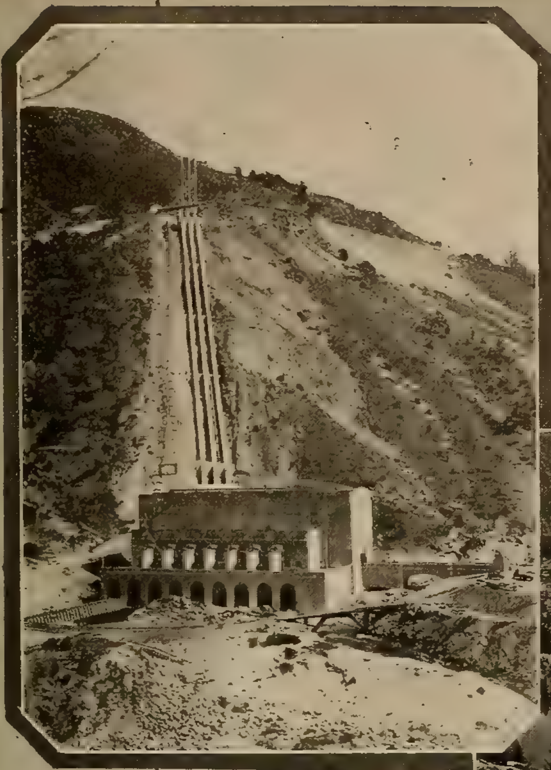
No sooner was Big Creek No. 8 completed than preparations for the construction of Big Creek No. 3 were started. This is the largest hydroelectric power plant in the West, and will have an ultimate capacity of 163,000 kw. It is located at the junction of Mill Creek and the San Joaquin River six miles below Big Creek No. 8, using all the water in the San Joaquin River plus the amount released from Huntington Lake and passing through power plants Nos. 1, 2 and 8.

There is a diversion dam across the San Joaquin River 150 ft. high and 485 ft. long, providing storage capacity sufficient to carry the present installation of 82,500 kw. for a period of 7.75 hours. A tunnel 30,000 ft. long and having a capacity of 3,000 sec. ft. conducts the water from the diversion dam to the penstocks. The intake for this tunnel is a reinforced concrete structure 115 ft. high, with a cylindrical gate 22 ft. in diameter and 90 ft. high. This gate is motor-operated and hydraulically balanced.

One of the odd features of this installation is the surge chamber, on account of its peculiar shape. This chamber is cut out of solid rock and takes the form of a mammoth hour glass 200 ft. high. The bottom diameter is 60 ft. and the top diameter 78 ft., and these two chambers are connected by a shaft 26 ft. in diameter. The large sections provide for load suddenly applied. Any surge caused by the sudden shutting down of the machines in the power house will be taken care of by allowing the water column to rise and fall in the upper chamber. The center line of the surge chamber is offset 48 ft. from the center line of the tunnel in order to facilitate construction.

Another outstanding feature of this installation is the peculiarly shaped manifold used to form the transition from the 18-ft. pipe leading out of the tunnel to the six penstocks which are 7.5 ft. in diameter.

Due to the high head and large diameter, it was not practicable to use the ordinary branch fitting type of manifold because there would have been unbalanced stresses around the outlets to the penstocks that would have been impossible to take care of satisfactorily. To overcome this difficulty a manifold was designed consisting of two 24-ft.-diameter spheres made from 5/8-in. steel plate. These spheres are connected by a short section of 15-ft. piping. To one of these spheres the 18-ft. pipe to the tunnel and two penstocks connect, while the other sphere provides connection for the remaining four penstocks. The advantage of the spherical design is that the only



BIG CREEK power house No. 3 as it appeared shortly after completion. The four tower lines, two from the upper plants and two to Los Angeles, may be distinguished to the right of the surge pipes. These lines converge at the 220-kv. switchyard at the plant. The view of the Florence Lake reservoir site gives an idea of the character of the upper Big Creek country. One of the more unusual features is the ball-type manifold designed by H. L. Doolittle.

force to be provided against is excessive tension around the outlets that is overcome easily by reinforcing rings placed on the outside of the pipes.

There are three 27,500-kw. 11-kv. generators installed in power house No. 3 at the present time, but the ultimate capacity calls for six machines. The unit system has been carried a little further than usual. Two generators and one bank of three 18,500-kva. transformers form one unit. This eliminates a low-tension bus, reduces high-tension switching equipment and saves on transformer unit cost.

Each bearing of the main units has its own gear-driven lubricating oil pump which forces oil from below the bearing to the top of the bearing, thus keeping the oil circulating continuously. Motor-driven oil pumps are installed for starting and are arranged to start automatically in case a gear-driven pump should fail.

Generators and transformers are protected by differential relays which, under severe conditions, open the high and low-tension circuit breakers, open the generator field and close the wicket gates of the turbines, thereby shutting down both generators.

Big Creek No. 3 is of peculiar interest because it is the first power plant built for straight 220-kv. operation. The 220-kv. switch rack covering over 80,000 sq. ft. is several hundred feet from the power house, and the present capacity takes care of four line positions and two transformer positions. It is of double-bus design, and the main buses are made of 4-in. standard iron pipe supported by insulated piers.

Big Creek No. 3 is the strategic and controlling unit of the Big Creek system of hydroelectric plants due not only to its physical location at the extreme lower end of the major portion of the entire development, but to the fact that the transmission lines from the upper plants come into its buses. In other words the generating system above this plant is almost an entirely separate unit as far as the rest of the system is concerned.

The change-over of the operating voltage of the Big Creek system from 150 kv. to 220 kv. took place in May, 1923, and was brought about by the necessity of having more transmission capacity to take care of the power to be generated at Big Creek No. 3.

By intensive studies and calculations it was found that 220-kv. transmission was possible and that it would be more economical and much quicker to convert the two 150-kv. lines to the higher voltage than to build duplicate lines for 150-kv. operation. In either case the transmission capacity would be doubled.

Due to the increase in the legal distance required between conductor and ground it became necessary to raise the height of many of the towers from 5 to 20 ft. in order to get the required clearance. As the lines could not be taken out of service for any but very short periods, it was found necessary to raise most of the towers while the lines were in full operation at 150 kv.

Back in 1920, before the starting of Big Creek No. 8 or Big Creek No. 3, plans had been made and work started on one of the most imposing single projects that the Edison company has undertaken. This was the Florence Lake tunnel which was to divert the waters of the South Fork of the S Joaquin River, bringing them down to Huntington Lake where they could be utilized for power while passing through the Big Creek power plants Nos. 1, 2, 8 and 3.

It took nearly four and one-half years to build the tunnel but it will increase the output of the present plants by 250,000,000 kw-hr., and when the future power plants are completed the waters coming through Florence Lake tunnel will produce over 1,250,000,000 kw-hr. The tunnel is 13.5 miles long with a height and width of 15 feet. It is the longe tunnel of its bore in the world and likewise holds t world's record for monthly, weekly and daily pr gress. During one week a record of 174 ft. was mad or more than 1 ft. per hour through solid granite.

While the straight line between Florence and Huntington Lakes is only 11 miles, it was thought advisable to lay out the tunnel in three sections. This added 2.5 miles to the total length, but by increasing the available working headings from two to six it was estimated that a saving of two years could be made in the total time to complete the tunnel. By fitting the equipment to the conditions and operating in the most efficient manner the job was completed one year in advance of the original estimate.

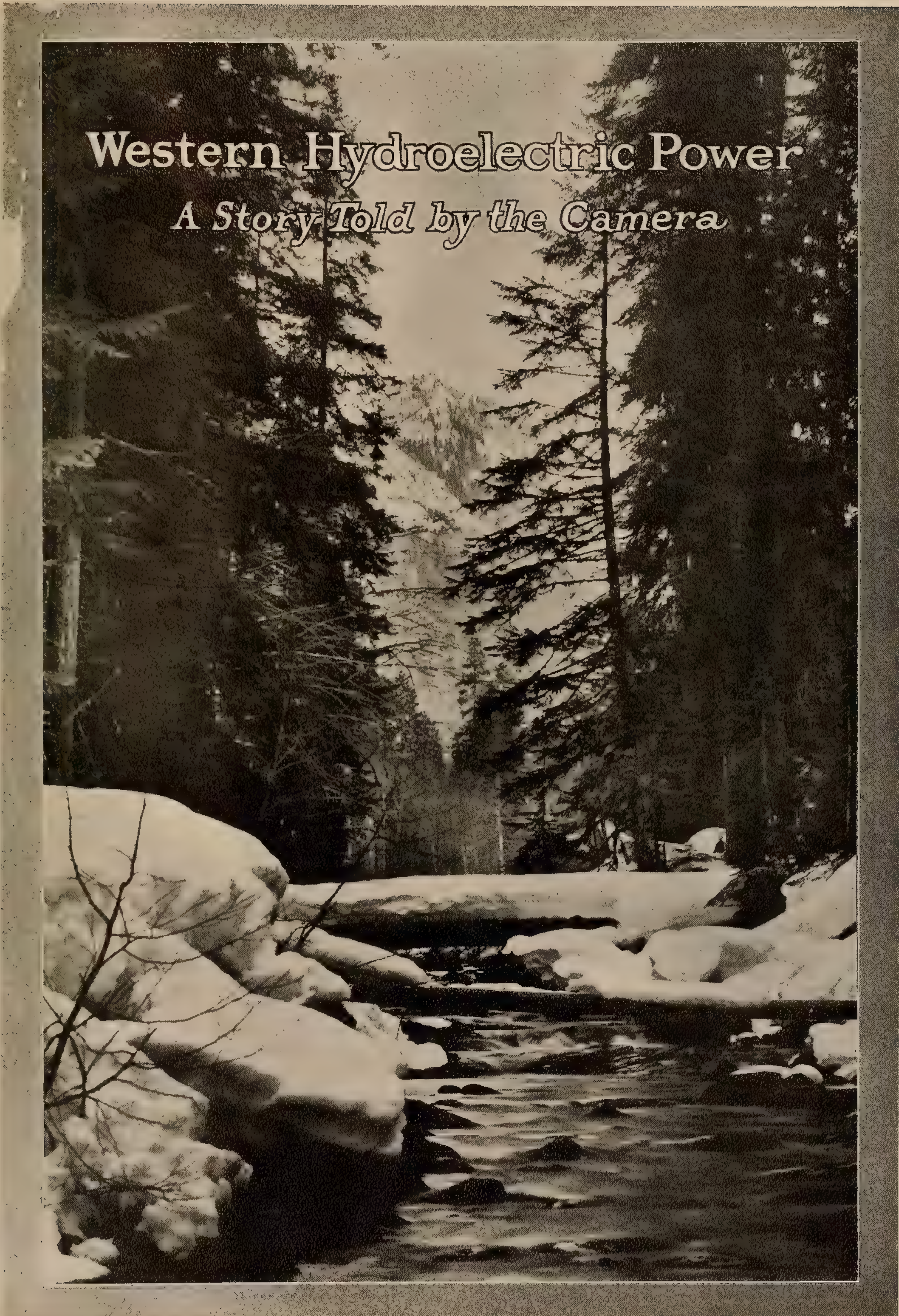
Some of the contributing factors by which efficiency was obtained may be mentioned:

Steam shovels operated by compressed air were used for mucking; large dump cars of from 4 to 6 cu. yd. capacity replaced smaller ones; and combination storage-battery and trolley-type locomatives made possible larger loads. A 24-in. wood-stave pipe for ventilation was easy to repair and permitted the use of larger blowers which cleared the tunnel of powder gases in a short time. Discoveries and improvements in powder and dynamite increased the force and reduced the gases. Drilling tools were improved and lengthened, making possible the wonderful records in progress.

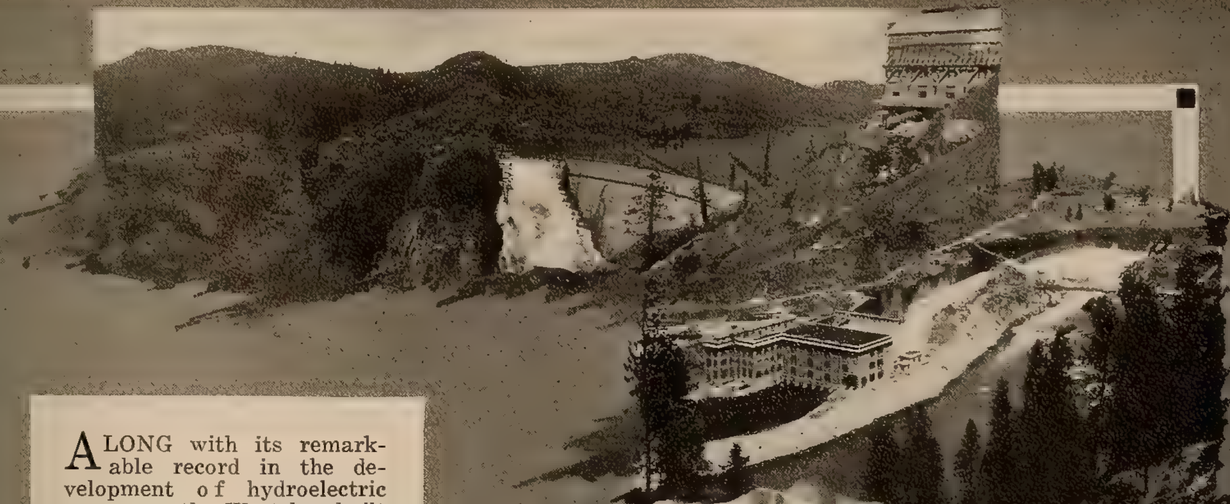
In order to accomplish this enormous amount of construction work it has been necessary to inaugurate a standing army of construction men on a permanent basis. The active front of construction and development work during the last five years has covered an area 72 miles long and 32 miles wide, a territory of virgin forests and lofty mountains accessible only by steep and narrow trails. Road-building has proved to be one of the best by-products of the art of hydroelectric development.

Coincident with the great production of water power was the necessity of supplementing it with steam power. As a consequence, a large steam plant was erected at Long Beach and placed in operation in December, 1924. This is the largest steam plant west of the Mississippi River. It uses high-pressure superheated steam, has the last word in modern appliances, and obtains an exceptionally high efficiency of operation.

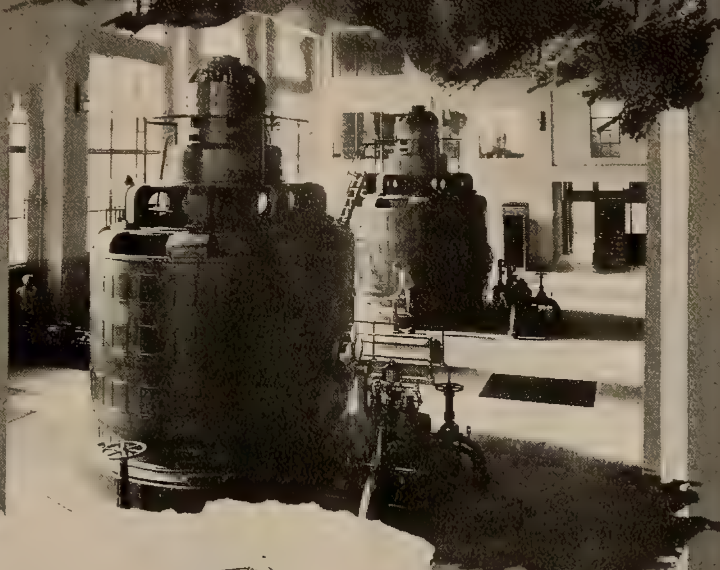
While the achievements have been many and the progress rapid since the Big Creek system was conceived, the increased demand for more and more power necessitates continued planning and effort to meet the needs of the future.

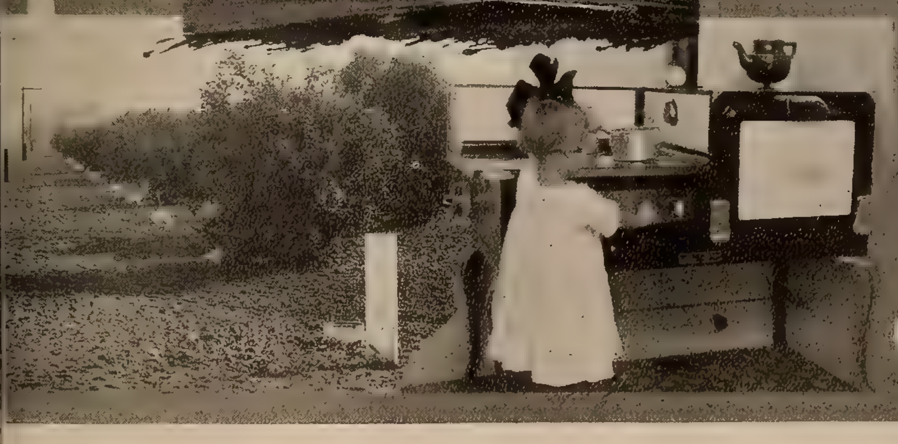

Western Hydroelectric Power
A Story Told by the Camera

THE electrical story of the West can be told in two words—water power. The U. S.G.S. estimates that 35,000,000 hp. or 72.73 per cent of the total water power resources of the country is in the eleven Western states. Washington is first with 17.74 per cent, California second with 14.44 per cent, and Oregon, Idaho, Montana, Arizona, Colorado, Wyoming and Utah follow in order. Only 2,875,000 hp. or 8.2 per cent of these water-power resources have been developed. With the 1,250,000 hp. in steam, the total installed capacity is 4,125,000 hp. or 16.5 per cent of the nation's total.

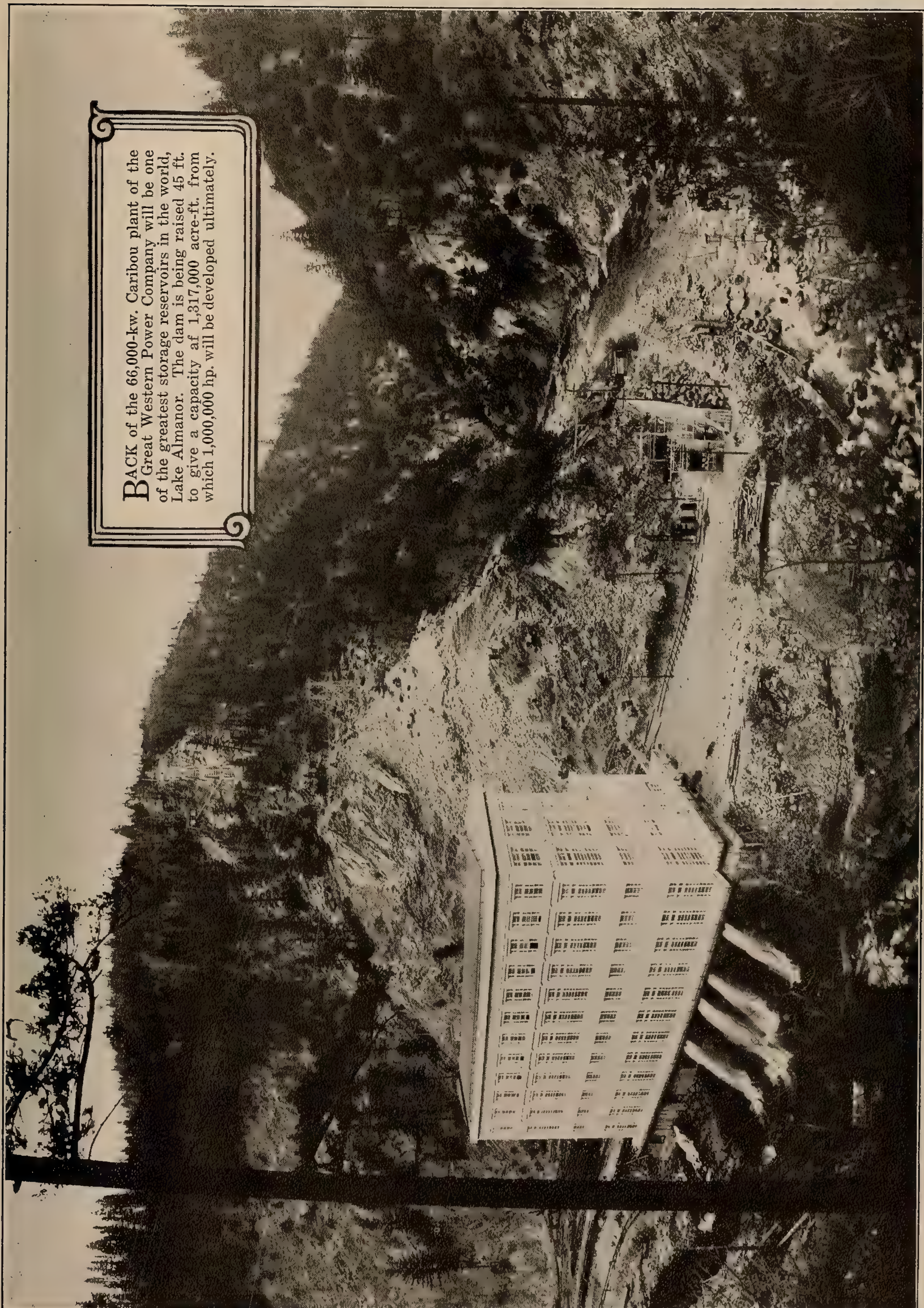


ALONG with its remarkable record in the development of hydroelectric resources, the West has built up an interconnected transmission system that has no parallel. This system extends from Mexico to the Columbia River and from Melstone in Montana to Puget Sound and the Canadian border. Two small gaps remain before the entire systems of Montana, Washington, Oregon and California will be united. Several notable records have been achieved, including transmission at 220,000 volts, and construction of the United States' highest head plants.





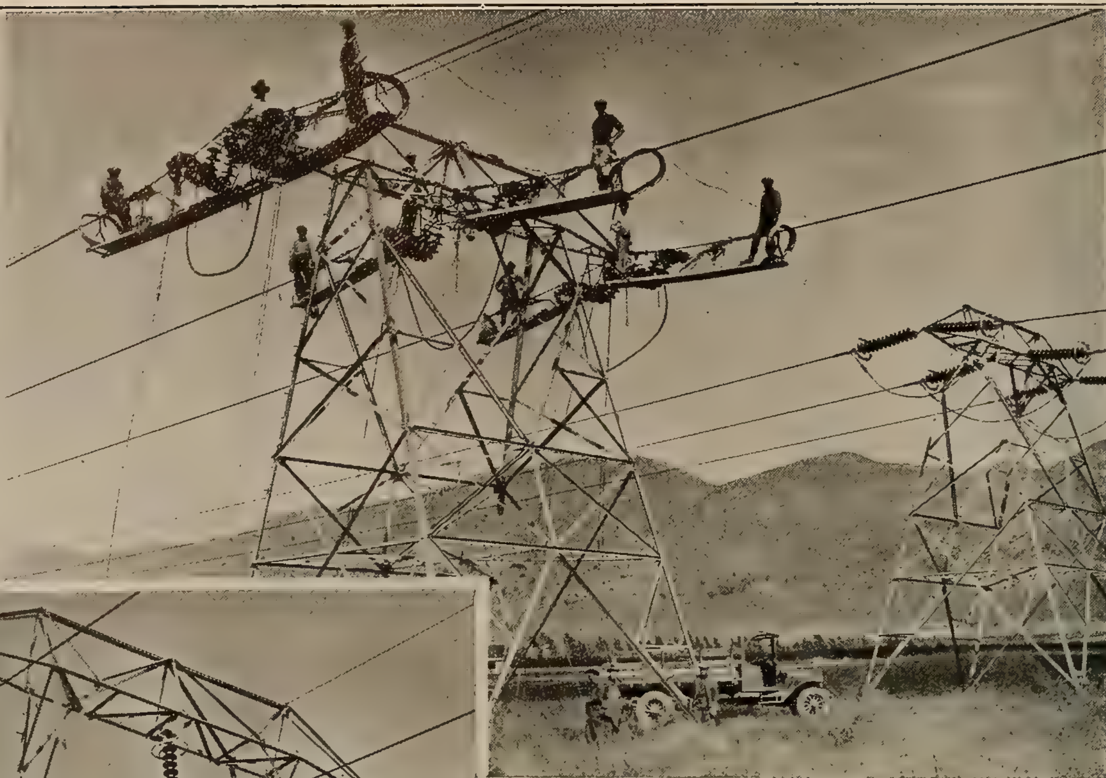
WONDERFUL changes have occurred in the 35 years of hydroelectric progress in the West. Here the two extremes, the Rome plant built in the late nineties, and the Big Creek No. 1, one of the modern installations.

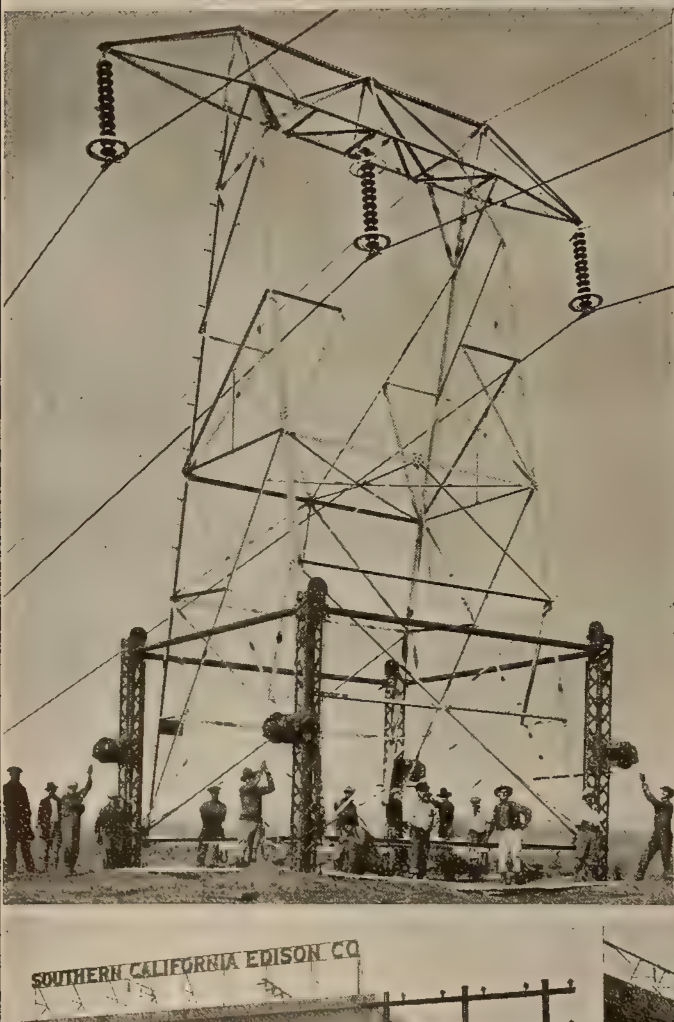


BACK of the 66,000-kw. Caribou plant of the Great Western Power Company will be one of the greatest storage reservoirs in the world, Lake Almanor. The dam is being raised 45 ft. to give a capacity af 1,317,000 acre-ft. from which 1,000,000 hp. will be developed ultimately.

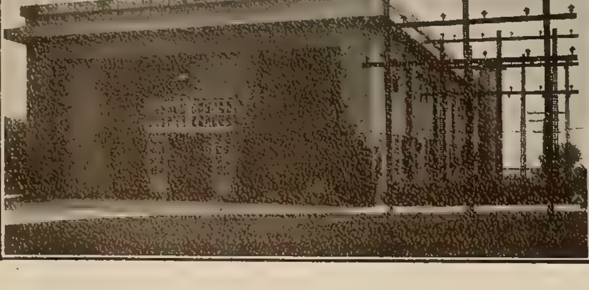
PIT No. 1, 70,000-kw. plant of the Pacific Gas and Electric Company on Pit River, is the first of a series of five generating stations which will utilize the waters of this spring-fed stream for the generation of more than 450,000 hp. Pit No. 3, the second unit of this development, shortly will be in operation, and work is progressing on Pit No. 4.

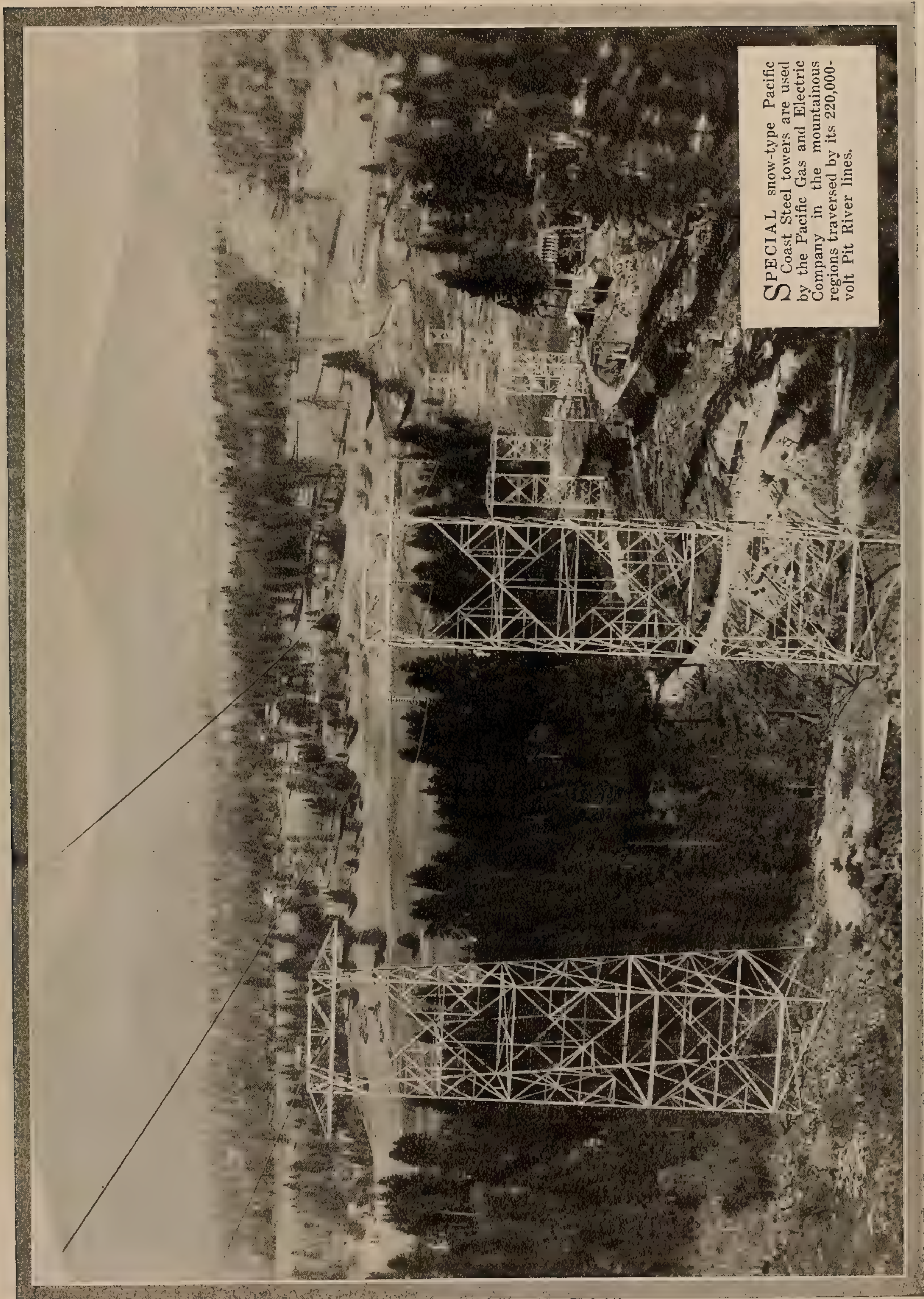
O'SHAUGHNESSY Dam on the Tuolumne River in central California is an important part of San Francisco's future water-supply system. At present the water is being used for the generation of power at the new Moccasin power house which has an installed capacity of 80,000 kw. The dam is 344 ft. high and the reservoir has a capacity of 206,000 acre-ft. Four units are installed at present; the ultimate capacity is six units.



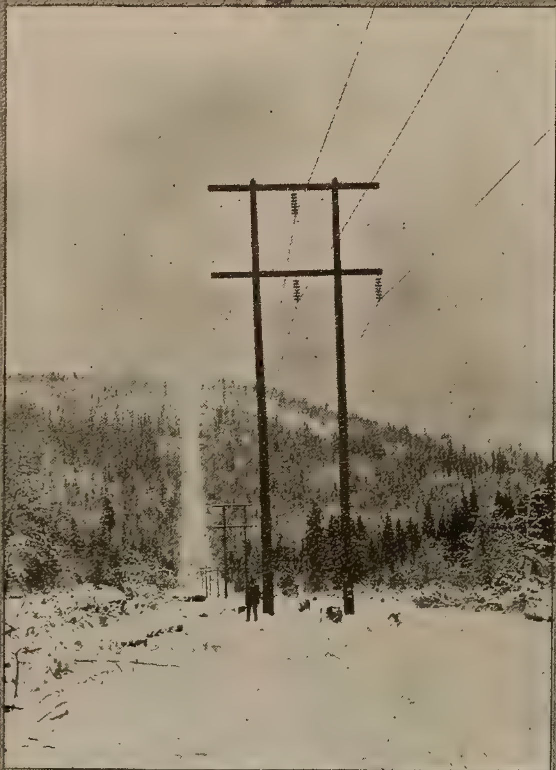


WHEN the Southern California Edison Company increased the voltage of its Big Creek lines from 150,000 to 220,000 volts, the existing towers were raised to provide greater clearance. Sections of one circuit of the twin-circuit line were taken out of service, re-insulated and the towers raised. This company was the first to use 220,000 volts commercially. At the present time it is planning the construction of an additional line of this capacity from its Big Creek plants to Los Angeles, and will start work this summer. Ultimately the Edison company will deliver 1,300,000 hp. from its Big Creek and San Joaquin River plants.



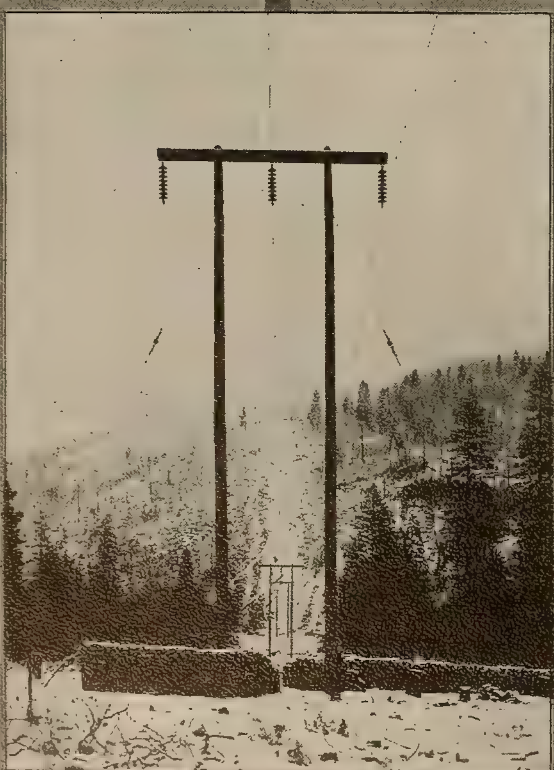


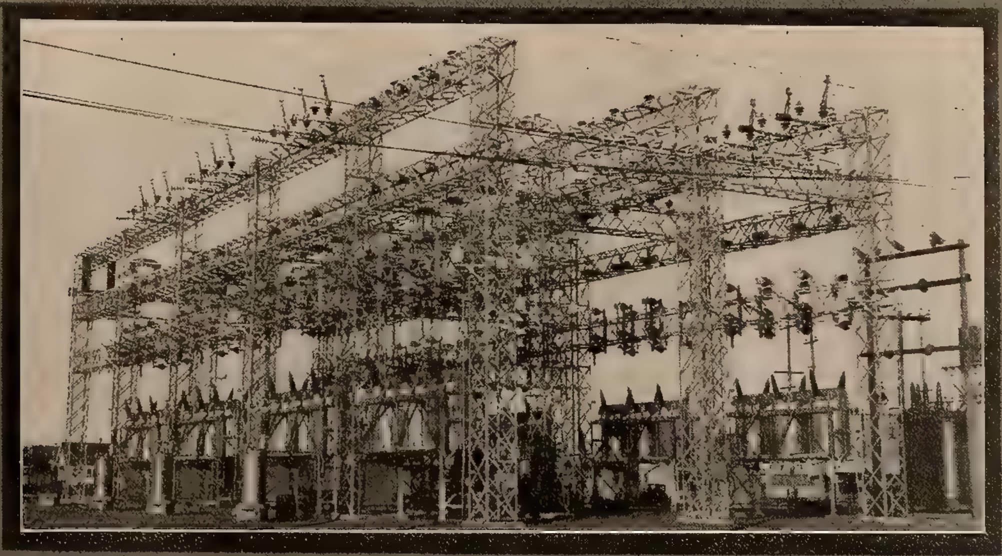
SPECIAL snow-type Pacific Coast Steel towers are used by the Pacific Gas and Electric Company in the mountainous regions traversed by its 220,000-volt Pit River lines.



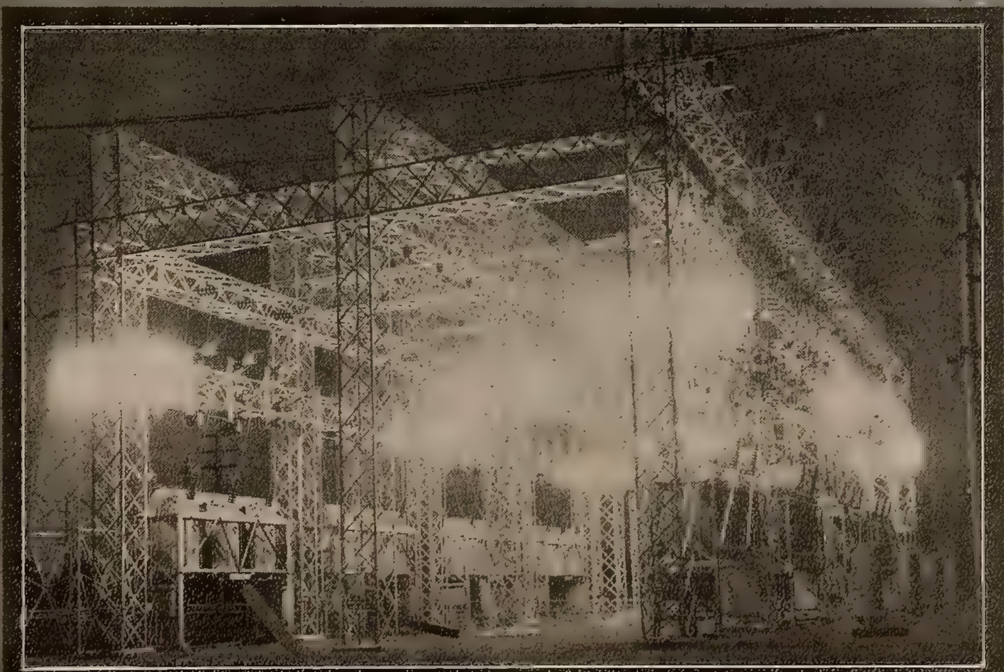
ONE of the important links in the Pacific Coast interconnected transmission system is the recently completed 110,000-volt line of the California Oregon Power Company which ties its system with that of the Pacific Gas and Electric Company. Thus the California transmission network is linked with those in Oregon. Plans now are being settled for the interconnection of the systems of the Mountain States Power Company and the Portland Electric Power Company. This will leave but one small gap in a system which will extend from Mexico to Canada and from Puget Sound eastward through Montana to Melstone, a point not far from the North Dakota border. This network will extend into six states and will include the systems of fifteen major power companies.

THE importance of such a transmission network was demonstrated forcibly in 1924 during the acute water shortage in California. During that time power was transported in large blocks between three, four and five systems in California. As time passes, the links between the various systems are being increased in size and there are points where as high as 25,000 kw. can be interchanged. At one point a 40,000-kw. tie is planned for the very near future.



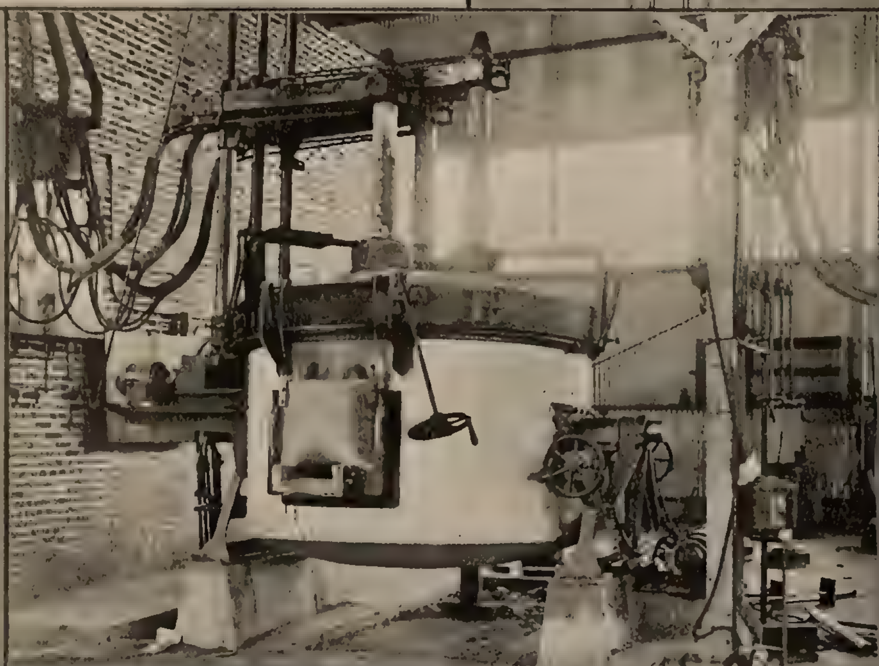


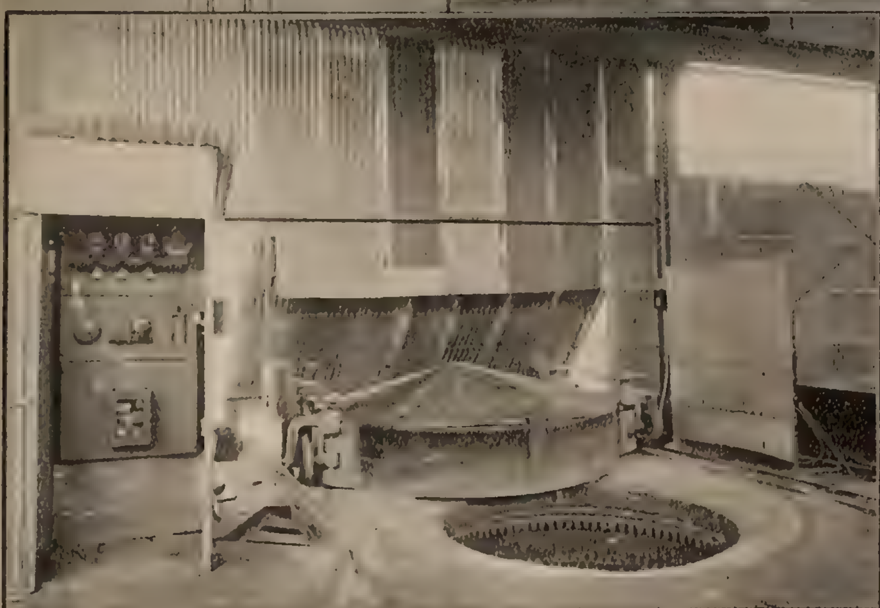
THE trend in Pacific Coast bus construction is toward the outdoor location. This is true for the lower voltages as well as for the higher voltages. Weather conditions of all sorts have been encountered successfully even where the severest kind of conditions are of common occurrence. The cuts shown picture the 60-kv. switching structure at the Lents substation of the Portland Electric Power Company. This station serves as the terminus of the four transmission lines from the River Mill, Cazadero, Bull Run and Oak Grove plants.



ELECTRICITY plays an important role in the large oil fields of the West. It has been employed successfully for pumping for many years, and considerable success now is being experienced in the drilling of wells with electric motors. There are many oil fields which are electrified completely.

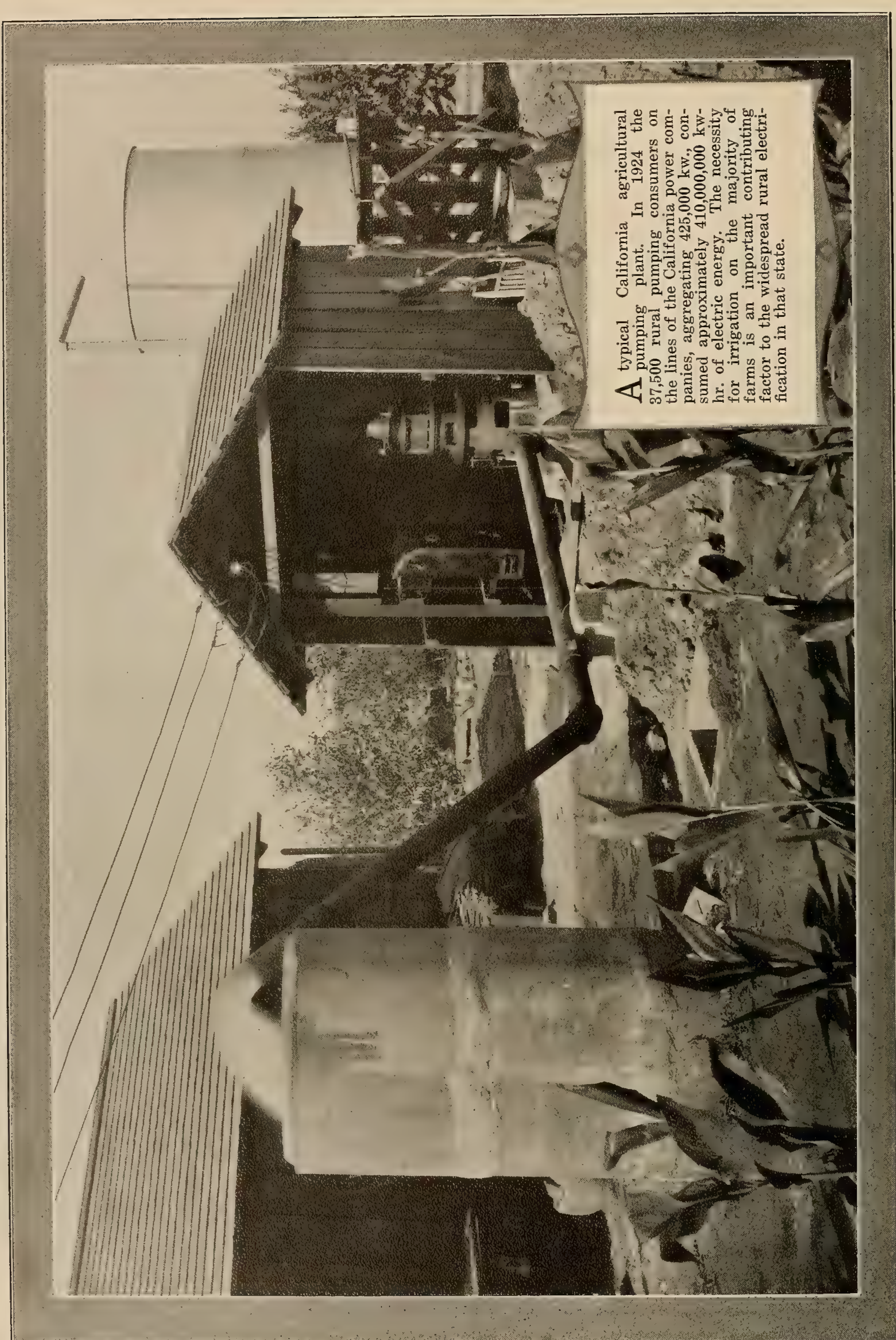
INDUSTRIAL heating is one of the greatest fields for future application of electricity in the Western states. A completely electrified foundry is located in Los Angeles, and there are few cities where there is not at least one electric furnace. There are also many electric ovens of various types.





ELECTRIC cooking and water heating has been developed to such a degree in practically all of the Western states that many companies have one electric range for every seven domestic consumers. California has 21,000 electric range users, Oregon, Washington and Idaho more than this number. One company alone plans to sell 8,000 electric ranges this year.

ELECTRICITY continues to play an increasingly important rolė in the lumbering industry of the Pacific Coast, not only in the sawmills but in the woods as well. The accompanying two views show an electric yarder on the properties of the Snoqualmie Falls Lumber Company in Washington. Motors of capacities ranging from 300 hp. upward are used in this class of service.



A typical California agricultural pumping plant. In 1924 the 37,500 rural pumping consumers on the lines of the California power companies, aggregating 425,000 kw., consumed approximately 410,000,000 kw-hr. of electric energy. The necessity for irrigation on the majority of farms is an important contributing factor to the widespread rural electrification in that state.

The Interconnected Transmission System of California

By W. G. Vincent, Jr.

Vice-president and Executive Engineer, Pacific Gas and Electric Company

THE network of transmission lines in the West at the present time makes possible, by interconnection, the transmission of power from Vancouver, Wash., to Yuma, Ariz., a distance of about 1,400 miles. The closing of a 30-mile gap between Vancouver and Kalama, Wash., will tie together the Washington-Montana system with that of California and Oregon, so that territory covered will include six western states and extend from the Mexican to the Canadian border. This great interconnected system has grown to its present extent in the short space of twenty-five years; the story of its development in California from the beginning is told in this article.

WITHIN the electrical industry California has won renown for the development of high-head water power plants, the transmission of electrical energy at high voltages, and the application of the technique of high-voltage transmission to the economic distribution of its water powers; and in no phase of the development of the resources of California were there required more vision, courage, resourcefulness, initiative and confidence than in the harnessing and the transmitting of these powers in the form of electricity throughout the length and breadth of the state. The details of the problems encountered, both economic and technical, of the many failures, the long and painstaking research, and the final solutions, make a story that is an outstanding exemplification of that ingenuity and resourcefulness that has been such a potent factor in the development of American industry.

It is the purpose of this article to sketch very briefly from their beginnings, particularly during the past twenty-five years, the growth of the interconnected transmission system that now is operated by the electric utility companies of the state, and to call attention to some basic conditions which have affected this expansion, some of the problems which had to be solved, some of the chief accomplishments, and some of the resulting benefits without attempting to cover either the technical or economic side of the subject exhaustively or in detail.

Physiography

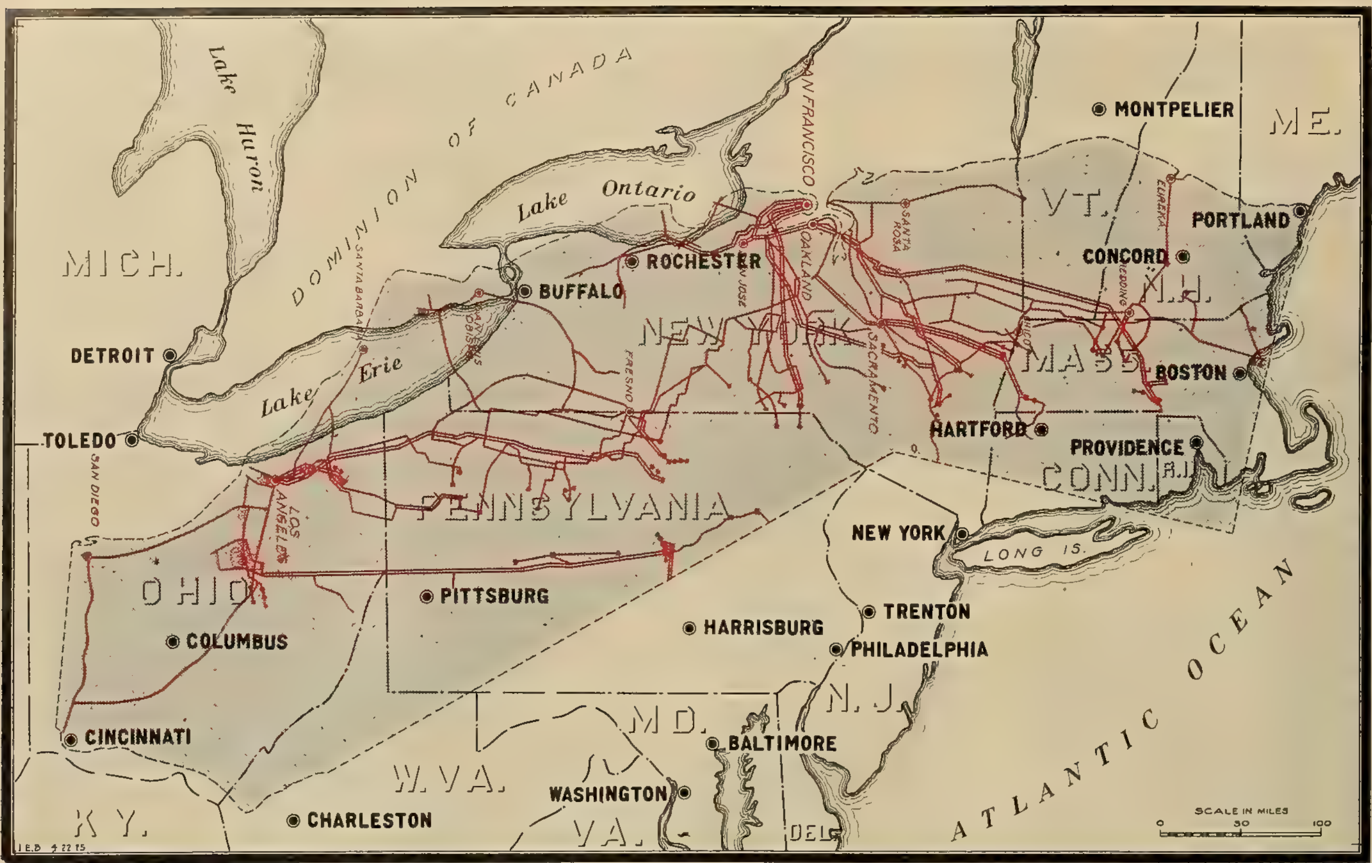
The physiographic geography of the Pacific slope is extremely varied in character and climatic conditions. The winters along the coast and in the great valleys are extremely mild in comparison with those in the same latitude on the Atlantic Coast, in spite of the fact that the forests rise until they meet living glaciers on the higher peaks in the northern mountains and the Sierra which is far-famed for its deep snows. Citrus groves extend as far north as the latitude of the southern boundary of Pennsylvania, and the contrasts in temperature between north and south are correspondingly much less than on the eastern coast. This uniformity of climate is due to prevailing winds bringing inland the nearly constant temperature of the great ocean to the west.

In California there is no coastal plain like that along the Atlantic, the mountains of the Coast Range rising abruptly from the shore, in some cases to elevations above 3,000 ft. East of this range lies the great valley, which is some 500 miles long with a floor of low-lying plains drained by the San Joaquin River from the south and the Sacramento River from the north, joining to enter San Francisco Bay. East of the great valley in the northern part of the state and paralleling the coast line rises the Cascade Range with its imposing Mt. Shasta, and continuing southward in the central and south central part of the state, the Sierra Nevada. Snow-capped peaks with forested slopes dot the entire length of both ranges. East of these ranges and generally east of California extending into Nevada, Arizona and Utah, lies an arid plateau region.

In general, therefore, it may be said that the Pacific slope has four major physiographic areas—namely, the Coast Range, the great valley, the Sierra Nevada-Cascade Range and the arid plateau, all parallel to the shore line and lying across the moisture-laden southwest trade winds, resulting in the winter season in belts of varying rainfalls as these winds come in contact with the Coast Range and Sierra Nevada-Cascade Range and the air currents from the land.

Geographic Comparison

To those who are not familiar with the topography of the Coast and its mountain ranges, the conception of its distances is usually from exaggerated-scale maps in railroad time tables, or from other small-scale maps wherein the comparisons with eastern territories are lost. Few realize that California is 800 miles long and that it has an area of 155,000 sq. miles or three and one-half times that of Pennsylvania. The projection of a few of the west coast



Area and transmission lines of California superimposed on the eastern section of the United States. California cities and transmission lines shown in red

points to the eastern seaboard of the same latitude indicates the distances in terms of places better known.

West Coast	East Coast
Seattle	Gulf of St. Lawrence
Portland	Augusta, Maine
North California line	Boston, Mass.
San Francisco	Richmond, Va.
Los Angeles	Columbia, S. C.
San Diego	Charleston, S. C.
South California line	Savannah, Ga.

The accompanying map superimposing California on the East will assist in a comprehension of the dimensions of the state and the relative distances, and particularly the area covered by its transmission systems.

It will be noted that if an area the size and shape of California were laid out in the eastern section of this country it would include both Portland, Me., and Cincinnati, Ohio. Sacramento would be located near Albany and Los Angeles near Cleveland. The names of California cities are printed in red, and the red lines on the map show the main transmission lines now in operation in California.

Early Problems

The early developments in the science of the use of electrical energy and the development of electric service found California with well developed population centers on tidewater, a well developed activity in mining, utilizing direct application of water power, and the beginning of an industrial development. It was, however, without a cheap and adequate fuel supply. The problem, therefore, before the engineers was to convert the water powers, which are in the main in the Sierra Nevada, into electrical energy, and to transmit it to the distant power markets already available.

There were many difficulties to be overcome such as the relatively small stream flows, necessitating the use of high heads, the extreme variation in stream flow, the severe cold of the winters with heavy snowfall in the mountains, the ruggedness of the country, as well as the uncertainties and the unknown quantities and qualities involved in the generation and transmission of electrical energy.

For many years the development, construction and operation of the interconnected transmission system of the state have been followed with interest by the electrical engineers of the country, but recently, due to the widespread interest both within and outside of the electrical industry in "Superpower" and "Giant-Power," the methods employed and the results accomplished in California have attracted more widespread attention as demonstrating, in a practical way, the results which can be attained by a regional transmission system.

Maps of Progressive Development

In 1900 there were 21 separate lines operating at 10,000 volts or over, totaling 700 miles, that may be classed, as of that time, as transmission lines. In 1925 there is in operation an interconnected network consisting of about 9,000 miles of line operating at voltages of from 20,000 volts to 220,000 volts. The transmission voltages of 1900 are the distribution

voltages of today, and voltages as low as 10,000 volts now are not classed as transmission.

In order that the progressive steps which have taken place in the development of this network may be presented as clearly as possible, six maps have been prepared, one for 1900, and one as of the end of each five-year period from 1900 to 1925. On the period maps the transmission lines built during the five years are represented by heavy solid lines, and the lines which were in operation at the beginning of the period are shown by lighter broken lines.

The map of 1910 shows that four separate companies by that year had built lines from the mountains to the San Francisco Bay district, and a study of all the maps will show how the lines have been extended gradually, step by step, and mile by mile, over the state from the mountain canyons of the north to the deserts in the south.

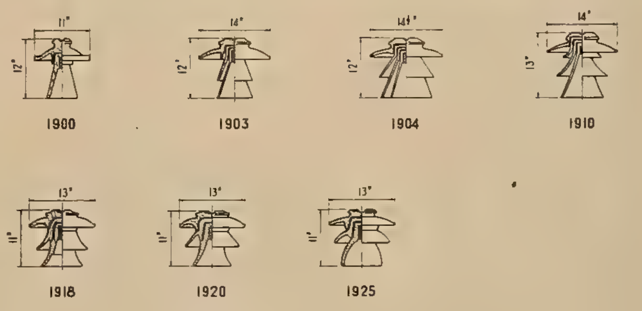
Early Developments

The first hydroelectric transmission line in America was put into operation by the Willamette Falls Electric Company in 1890. Power was transmitted at 4,000 volts over individual circuits from the different generators in the power house to Portland, 13 miles distant. As the load increased, new circuits were added until the pole line carried about thirty wires and had more resemblance to a telephone lead than to that which we now think of as a transmission line.

The first long-distance high-tension transmission line in the world was constructed in 1891 and 1892 by the San Antonio Light & Power Company, largely through the efforts of Dr. C. G. Baldwin, Almerian Decker and William Stanley. The following is a resume of Frederick Hall Fowler's interesting account of this development (see "Hydro Electric Power Systems of California" by Frederick Hall Fowler, Department of the Interior, Water Supply Paper No. 493):

The project was begun largely through chance. In 1890 Dr. C. G. Baldwin was made president of Pomona College. Shortly after his arrival he was urged to join the town Board of Trade. The board offered its support for any undertaking which he considered to be in the interest of the community. Thinking the whole matter a jest, he suggested utilizing the water power in a neighboring canyon for lighting the town. The board accepted the proposal and made him chairman of the Water Power Committee.

Dr. Baldwin acquainted himself with the Ventura system, which consisted of a small direct-current transmission line four miles long. He purchased the site in San Antonio Canyon for $25,000; organized a company; secured the backing of Thomas Bard, which lent business prestige to the scheme, and engaged Almerian Decker to draw up plans and specifications. Dr. Baldwin went to Pittsburgh and presented his plans to the Westinghouse Electric & Manufacturing Company, which declared the plan impracticable and refused to take the contract. Greatly discouraged, Dr. Baldwin proceeded to a missionary conference at Pittsfield, Mass. There he was greatly impressed by the brilliant illumination of the town. He hastened to the laboratory of Mr. Stanley, who was responsible for the success of the system, and placed his plans before him. Mr. Stanley gave his enthusiastic approval and promised to manufacture the machinery himself if neither the Westinghouse nor the Thomas-Houston companies would undertake it. Dr. Baldwin revisited the Westinghouse company, which not only accepted the contract but guaranteed the performance of the generating equipment. The generators were successful from the first, but the motors were not.



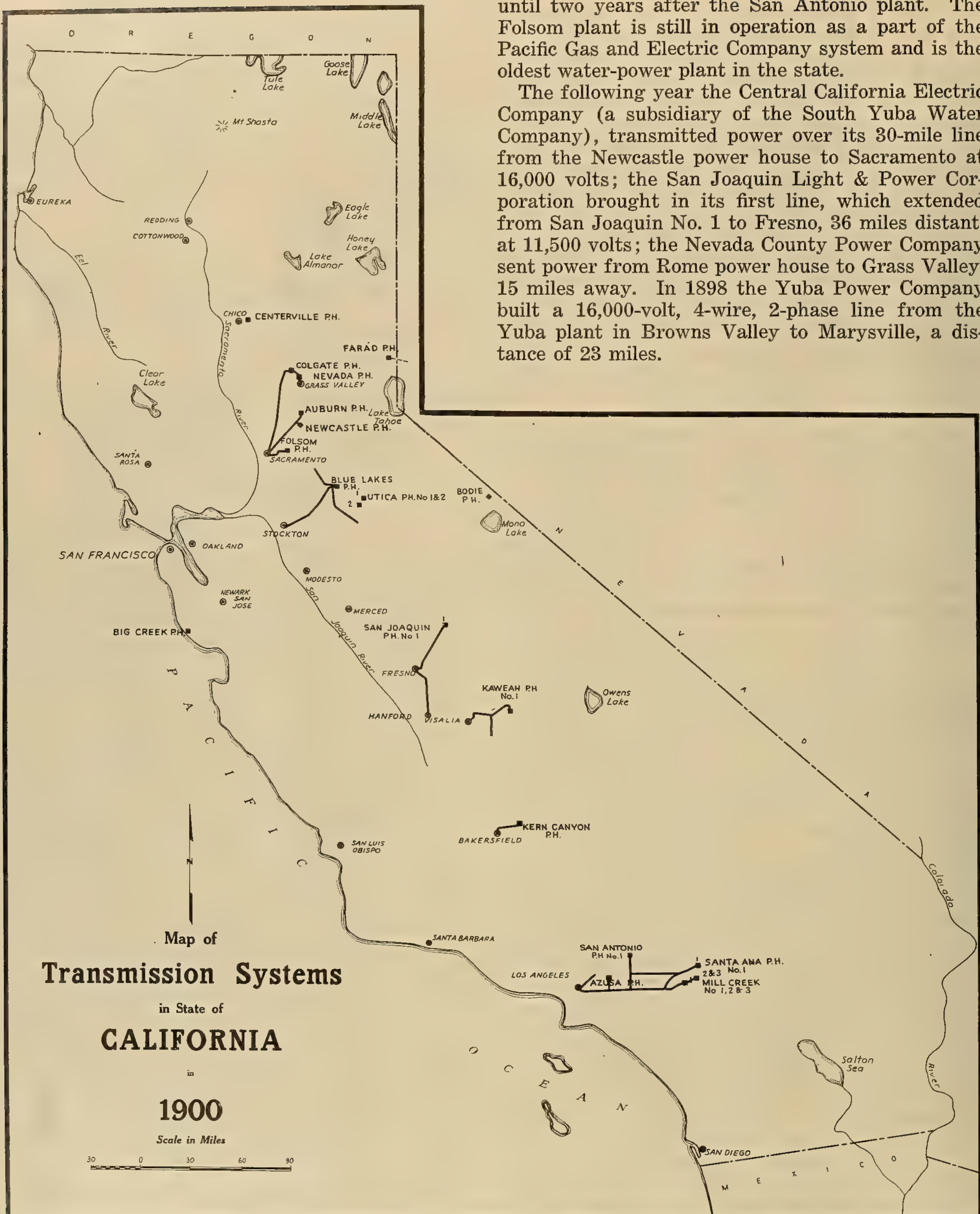
TYPES OF 60,000 VOLT INSULATORS USED FROM 1900 TO 1925

Power was generated in the San Antonio Canyon plant at a generator potential of 1,000 volts; stepped up to 10,000 volts by twenty 6½-kw. transformers, connected in series, and transmitted 28 miles to San Bernardino on one single-phase circuit and 14 miles on another circuit to Pomona. (From Nov. 28, 1892, until Feb. 16, 1893, the energy was transmitted at 5,000 volts.)

September, 1893, marked the completion of the first commercial polyphase transmission system in the world. Undaunted by the refusal of the Westinghouse company to build three-phase generators for the Ponoma plant, Mr. Decker made arrangements with the General Electric Company, through the Redlands Electric Light & Power Company, for the delivery of two 250-kw., 2,400-volt, three-phase generators for direct connection to Pelton water wheels. These were installed in the Mill Creek No. 1 power house, now a part of the Southern California Edison system. The first delivery was made to Redlands, 7½ miles distant, at 2,300 volts. After three years of successful operation, the potential was raised to 10,000 volts and another three-phase, 10,000-volt line built to Riverside, 20 miles distant.

Also in 1893 power transmission was developed by the Standard Consolidated Mining Company at Bodie, in central California. This was a 3,500-volt line, 13 miles in length, which supplied power to the mines.

On Admission Day, Sept. 9, 1895, the Sacramento Electric Power & Light Company put into operation the Folsom plant—the first generating plant of any size in central California. Four 11,000-volt, 3-phase circuits on two pole lines from the power house to Sacramento, 23 miles away, supplied energy for the street railway system, lighting and incidental power. The history of this plant is extremely interesting as it was originally planned by Horatio P. Livermore in the 60's as a hydro-mechanical development, and the



foundation of the dam was started in 1866. The project met with many difficulties for several years, and then Mr. Livermore conceived the idea of an electrical development, with transmission lines to Sacramento, and was working to that end prior to the development in the San Antonio Light & Power Company, although the project was not completed until two years after the San Antonio plant. The Folsom plant is still in operation as a part of the Pacific Gas and Electric Company system and is the oldest water-power plant in the state.

The following year the Central California Electric Company (a subsidiary of the South Yuba Water Company), transmitted power over its 30-mile line from the Newcastle power house to Sacramento at 16,000 volts; the San Joaquin Light & Power Corporation brought in its first line, which extended from San Joaquin No. 1 to Fresno, 36 miles distant, at 11,500 volts; the Nevada County Power Company sent power from Rome power house to Grass Valley, 15 miles away. In 1898 the Yuba Power Company built a 16,000-volt, 4-wire, 2-phase line from the Yuba plant in Browns Valley to Marysville, a distance of 23 miles.

In 1899 power was delivered in Sacramento at 22 kv. over the 76-mile line of the Bay Counties Power Company from the Colgate plant on the North Yuba River. The voltage was raised in 1900 to 40 kv.

There was during this period a number of other developments under construction or being placed in operation utilizing voltages of from 10 to 22 kv.

Situation in 1900

By referring to the map for 1900 it will be seen that by that year there was a number of lines in operation in the state. Sacramento was supplied by the 40-kv. line of the Yuba Electric Power Company, bringing power from the Colgate plant; the 15-kv. line of the Central California Electric Company from the Newcastle and Auburn plants; and the 11-kv. line from the Folsom plant of the Sacramento Electric Power & Light Company. Two hydro plants, Folsom and Colgate (then only partially completed) and the first steam plant in Sacramento (located in substation at Sixth and "H" Streets), were operating then as one system. A short distance to the south the Blue Lakes Water Company had extended a 17-kv. line to Stockton and also constructed 17-kv. lines north and south along the "Mother Lode" to supply power to the mines in that section. All of these lines are now a part of the system of the Pacific Gas and Electric Company.

Fresno was supplied by a 11-kv. line of the San Joaquin Electric Company from the San Joaquin No. 1 plant, a distance of 36 miles, in 1896. Bakersfield also was supplied in 1897 from a plant on the Kern River by a line of the Power Development Company.

Los Angeles was supplied with power from the Azusa plant of the San Gabriel Electric Company, a distance of 23 miles, at 16 kv. (1898) and from the Santa Ana No. 1 plant of the Edison Electric Company, a distance of 83 miles, at 33 kv., a record voltage in 1899.

The Mt. Whitney Power Company commenced operation in 1899, transmitting power at 15,000 volts.

It will be seen clearly from the map that all these as yet were isolated lines and that the system development, as we now know it, had not yet been started except in the vicinity of Sacramento.

Outstanding Accomplishments

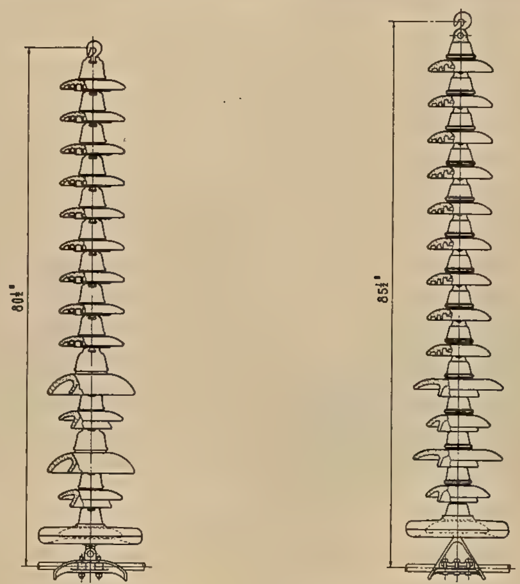
During the next five years the development was very rapid and 1905 found the system of the Pacific Gas and Electric Company taking definite form, as well as a number of lines of the Edison Electric Company and the Pacific Light & Power Company in operation in the southern part of the state.

It is not necessary to trace the growth of the systems from this time on as it is clearly shown on the maps, but the following are some of the outstanding accomplishments which attract our attention in reviewing the entire period from 1900 to 1925:

1901—The Bay Counties Power Company constructed two pole lines from Colgate to Oakland, a distance of 142 miles, in the year 1900, and these lines, then the longest transmission lines in the world, were placed in operation early in 1901 and operated first at 40,000 volts. Later the voltage was raised to 50,000 and in 1903 to 60,000.

A feature of the construction of this line was the crossing of Carquinez Straits with a 4,427-ft. span. That the pioneers built well is evidenced by the march of events, as the towers supporting this span constructed to support one 60-kv. circuit and one spare conductor now are supporting two 110-kv. circuits. Two additional cables were added in 1914 and the voltage raised to 110 kv. in 1922.

1903—In February of this year the lines of the Bay Counties Power Company and the Standard Electric Company were connected temporarily at Oakland, and while the plant of the latter company was being repaired power was transmitted over 300 miles. This was probably the greatest distance over which power ever had been transmitted commercially.



STANDARD STRINGS OF INSULATORS
(DIFFERENT MANUFACTURERS)
USED ON 220,000 VOLT TRANSMISSION LINE
OF PACIFIC GAS AND ELECTRIC CO.

1904—The Pacific Light & Power Company installed a 16-mile, 80-kv. experimental line using nine different types of insulators with both wood and metal pins. This line was built to determine the proper voltage to use for transmitting 10,000 hp. from the Kern River to Los Angeles, 125 miles.

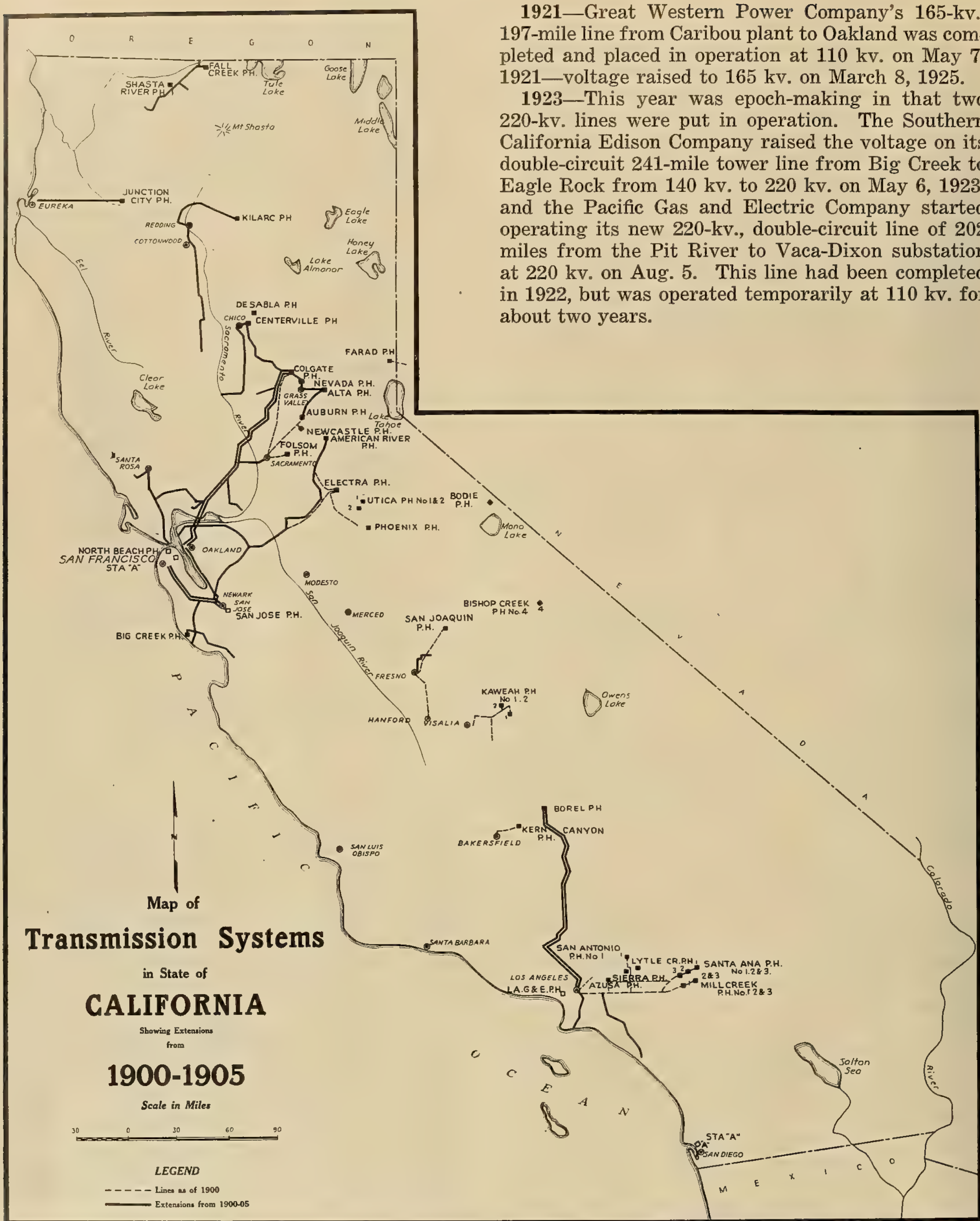
1905—The voltage of the Folsom-Sacramento line was raised from 11 kv. to 60 kv. and the four circuits made into one.

In this same year the Edison Electric Company built a 14-mile steel pole line using latticed poles.

1906—The Edison Electric Company built the first steel-tower line and the highest voltage line in the state, in constructing a 118-mile, 75-kv. line from Kern River No. 1 plant to Los Angeles.

1908—The Great Western Power Company put in operation the first 100-kv. transmission line, which shortly was followed by the line of the Sierra & San Francisco Power Company at 104 kv.

1913—The Southern Sierras Power Company completed the construction of a tower line from Bishop Creek to San Bernardino, a distance of 239 miles. This line was constructed to operate at 150 kv., but was operated at 55 kv. until early in 1917 when it was raised to 95 kv. This line has been extended to Yuma, Ariz., making a total transmission distance of 539 miles, which is certainly a record for regular



operation. In 1924 an 83-mile extension establishing a connection with the San Diego Consolidated Gas & Electric Company was built to Rincon from El Centro.

1913—Southern California Edison Company put into operation a 140-kv., 241-mile line from Big Creek to Eagle Rock on Nov. 8, 1913.

1921—Great Western Power Company's 165-kv., 197-mile line from Caribou plant to Oakland was completed and placed in operation at 110 kv. on May 7, 1921—voltage raised to 165 kv. on March 8, 1925.

1923—This year was epoch-making in that two 220-kv. lines were put in operation. The Southern California Edison Company raised the voltage on its double-circuit 241-mile tower line from Big Creek to Eagle Rock from 140 kv. to 220 kv. on May 6, 1923, and the Pacific Gas and Electric Company started operating its new 220-kv., double-circuit line of 202 miles from the Pit River to Vaca-Dixon substation at 220 kv. on Aug. 5. This line had been completed in 1922, but was operated temporarily at 110 kv. for about two years.

As far as the writer knows these two lines are still the only ones operating at so high a voltage.

Design and Construction

In the early days the location of the high-tension lines was one of rather simple economics. A definite amount of hydroelectric power at the power house

in a mountain canyon had to be transmitted to a substation supplying a city distribution system. These lines followed highways, railroad rights-of-way, and any easy and inexpensive route. The poles were usually squared redwood or round Douglas fir with one crossarm, the third insulator being mounted on the pole top. The poles were spaced uniformly except where long spans were necessary across canyons. In these spans wood frames were built, and the strain of the conductor was taken on a series of several insulators in a row. The conductor spacing was originally from 30 to 42 in., but lines of later date were increased due to large birds causing short circuits. The spacing between wires was 60, 72, and 84 in. for 60,000 volts.

Insulation was in these early days, as it is today, a vital and difficult problem of design and operation. The shapes and materials were made to provide protection in accordance with some preconceived conceptions as to what might take place. The "gutter type" or "water spout type" used on the two lines built into San Francisco in 1901 was the first used for 60,000 volts, and consisted of two parts cemented together. The top part was 11 in. in diameter and had cable and tie grooves as copied from the telegraph-line insulators, but the brim of the "hat" was constructed with a gutter around the edge, and a spout to discharge the rain clear of the lower part of the insulator. It was feared that if the drippings during a rain storm were allowed to surround the insulators completely serious leakage and flashing would result; to prevent this the gutter was formed. The lower part was a clear glass petticoat about 9 in. long over all with a flare of 6 in. at the bottom, and was cemented in place with sulphur and sand. The purpose of the petticoat was to prevent charring of the insulator pin and to keep it dry. In 1898 pins of turned eucalyptus wood boiled in linseed oil with threads to screw into the insulator were developed. One line was built with a porcelain sleeve around the pin under the petticoat. The next step was to increase the size of the head at the cable tie groove, and to leave off the gutter around the rim; then followed a 14-in. insulator with a third part, consisting of a shorter petticoat introduced between the pin petticoat and the head. In some types the third part was short and was set into the head part before firing. This left only one cemented joint to be made. In 1904 and 1905 the "California type" was developed, consisting of four parts cemented together. The fourth petticoat was completely enclosed, and the head was 14½ and 16 in. in diameter. The California type became a sort of standard for 60,000 volts or thereabouts for many years. The later improvements gave more flare to the petticoats to permit of washing of the inner surfaces by rain. The insulators of today are much thicker in cross-section of material and are usually three-part with less narrow space between the petticoats. The diameters are also somewhat less, being about 13 in.

With the growing necessity for larger blocks of power to be transmitted, economic transmission made higher voltages necessary, and transformers to provide these higher voltages were demanded of the manufacturers. With the development of the suspension-type insulator in 1906 and the use of wind-mill-type steel towers to provide for increased clearance impossible with wood pole construction, line potentials of over 100,000 volts rapidly came into use.

The adaptability of suspension-type insulators to higher voltages gave an impetus to this class of construction and also, more important, the economi-

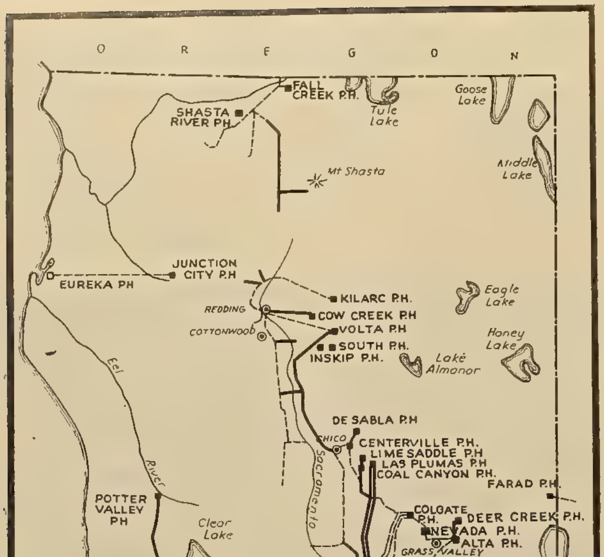
Dead-end towers in the mountain section on the Pacific Gas and Electric Company's 220-kv. Pit River line. In the valley section both circuits are carried on one tower

cal transmission of power from more distant and larger developments. The higher voltage lines then became the main trunk lines and the carriers of power from groups of power houses in the mountains, the energy being delivered to one or more distant transmission substations whose function was to feed the network at lower transmission voltages.

Today the standard steel towers for 220,000 volts used by the Pacific Gas and Electric Company are about 100 ft. high, and are designed to support six copper cables one inch in diameter on an 800 ft. span loaded with sleet and wind. The suspension insulators for this voltage consist of 13 discs of 10 in. and 14-in. diameter, making a string 7 ft. long.

There also have been some changes in the type of conductors used. A great many of the early lines were built with aluminum cables as well as copper. As transmission line loads increased and more amperes had to be carried, more conductivity was required, giving an impetus to the use of copper cables. When the aluminum cable manufacturers produced the steel-core aluminum cables, decreased sags with this type of conductor became possible, and today both copper and aluminum steel-core cables are in use. The conductors on the 220-kv. Pit River line in the mountains consist of special cables one inch in diameter, 518,000 circ. mil of aluminum in 42 wires wound on a steel center consisting of 19 strands. In the valley section special rope-laid copper cables of 500,000 circ. mil consisting of 7 strands of 7 wires each are used.

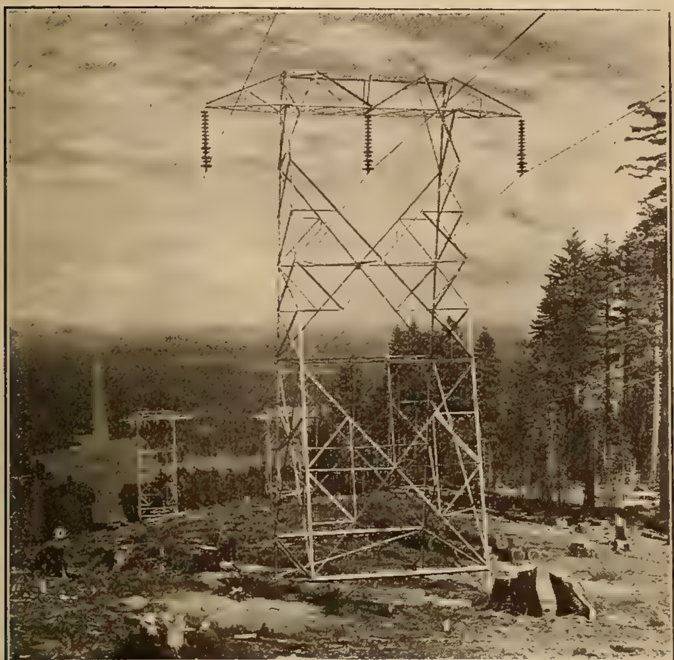
In the early days the attitude toward switching and the methods used are of interest. The voltage of the circuit was of more importance than the




amount of generating capacity, and, as the oil switch development lagged behind in the matter of voltage, fused air-break switches were devised for emergency operation. Back in 1897 these air-break switches were of fearful and wonderful design, called "plug type." These provided for plugging flexible connections by means of a long stick into receptacles. When the circuit was opened, each phase was pulled out separately and the arc extinguished by drawing it out as quickly and as long as possible. Other types of air switches were also developed and used until about 1904. It was customary to do all switching on the low-voltage side of transformers. In fact some engineers recommended no switches or fuses on the high side whatsoever.

The demand for satisfactory circuit breakers became so essential for satisfactory operation that in 1901 one of the operating companies developed the first successful method ever devised for rupturing high-tension currents in the form of a horizontal-break oil switch, using ordinary papier-mache wash tubs. The switch was designed for 40,000 volts and was revolutionary in high-tension switching equipment. There was one switch and tub on each conductor, hand-operated with remote control, which gave extraordinarily good service considering the low cost of manufacture. Its advent is important in history as the idea is fundamental with all subsequent switching developments.

One of the big problems presented in the joining together of the entire generating capacities of practically all of the power developments in the states of Oregon and California comes in the rupturing capacity of oil circuit breakers. Not only does the capacity of all the plants on the adjacent system concentrate on every switch, but also all that of the connected systems. It is the present practice of the Pacific Gas and Electric Company to specify oil circuit breakers at main switching points of about one million kilowatt rupturing capacity.



Standard mountain-type 220-kv. tower on Pacific Gas and Electric Company's Pit River line

Load Dispatching

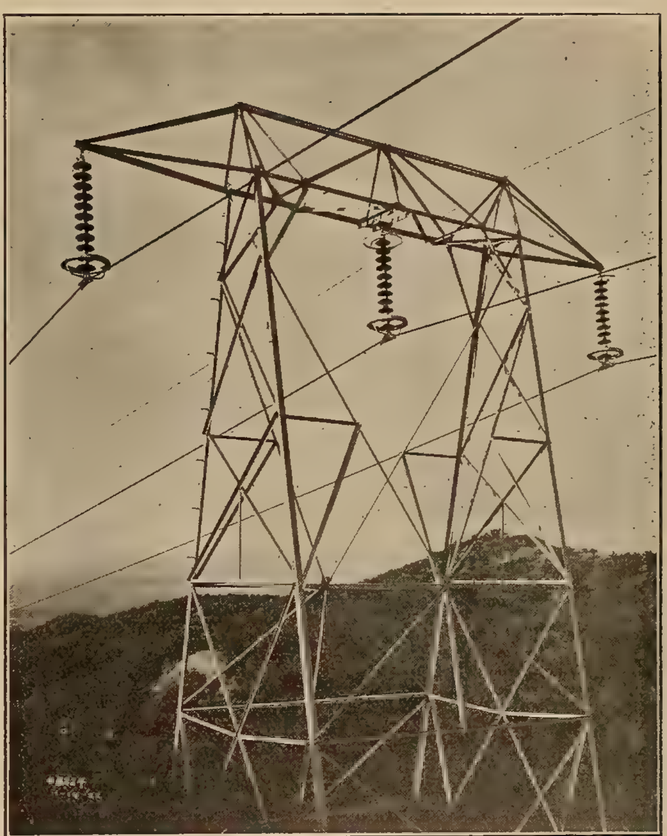
One of the collateral developments of interconnected plant operation was a method of control that is called "load dispatching," and today each of the large companies operating a number of plants has a load dispatcher who controls and directs the operation of all power plants, transmission lines and main substations. This control is exercised through a centrally located office with telephone connections, generally over private lines, with all power houses and substations. The load dispatcher has in front of him a diagram showing all lines and switches, and no switch may be opened or closed without his permission. He directs the amount of load that each plant is to carry from hour to hour and which plant is to govern the system and take the load fluctuations. He also directs the reservoir control, the canal flows, the regulations of voltage, the taking of lines and equipment out of service for repairs, and all other matters affecting the service under both normal and emergency conditions.

The first formal recognition of load dispatching as an essential feature of operation was in 1906 when the California Gas & Electric Corporation (predecessor in interest of the Pacific Gas and Electric Company) placed the operating control of its properties in the hands of a "load dispatcher" with headquarters in Oakland. By 1910 all of the large companies in the state had adopted this method of operation.

Interconnection

Prior to the war period connections had been established between the systems of the various companies, in some cases for the purpose of interchanging energy and standby service but principally to dispose of surplus power under contracts. The curtailing of construction, the high price of fuel, the general conservation policy of the country combined with a period of low rainfall and the appointment of a power administrator by the Railroad Commission of California all resulted in further interconnections and unified operations of practically all of the plants in the state, which resulted in the greatest possible utilization of the water-power and steam-power resources of all of the companies.

Practically every interconnection in the state has been made for the purpose of the delivery of a definite amount of power from one company to the other under contract, each step in the interconnections of the systems thus being justified economically at the time it was made. This method has resulted without any heavy financial burden, in the installations of lines and facilities, which are now of the greatest value in times of emergency in transferring power from one section of the state to another.



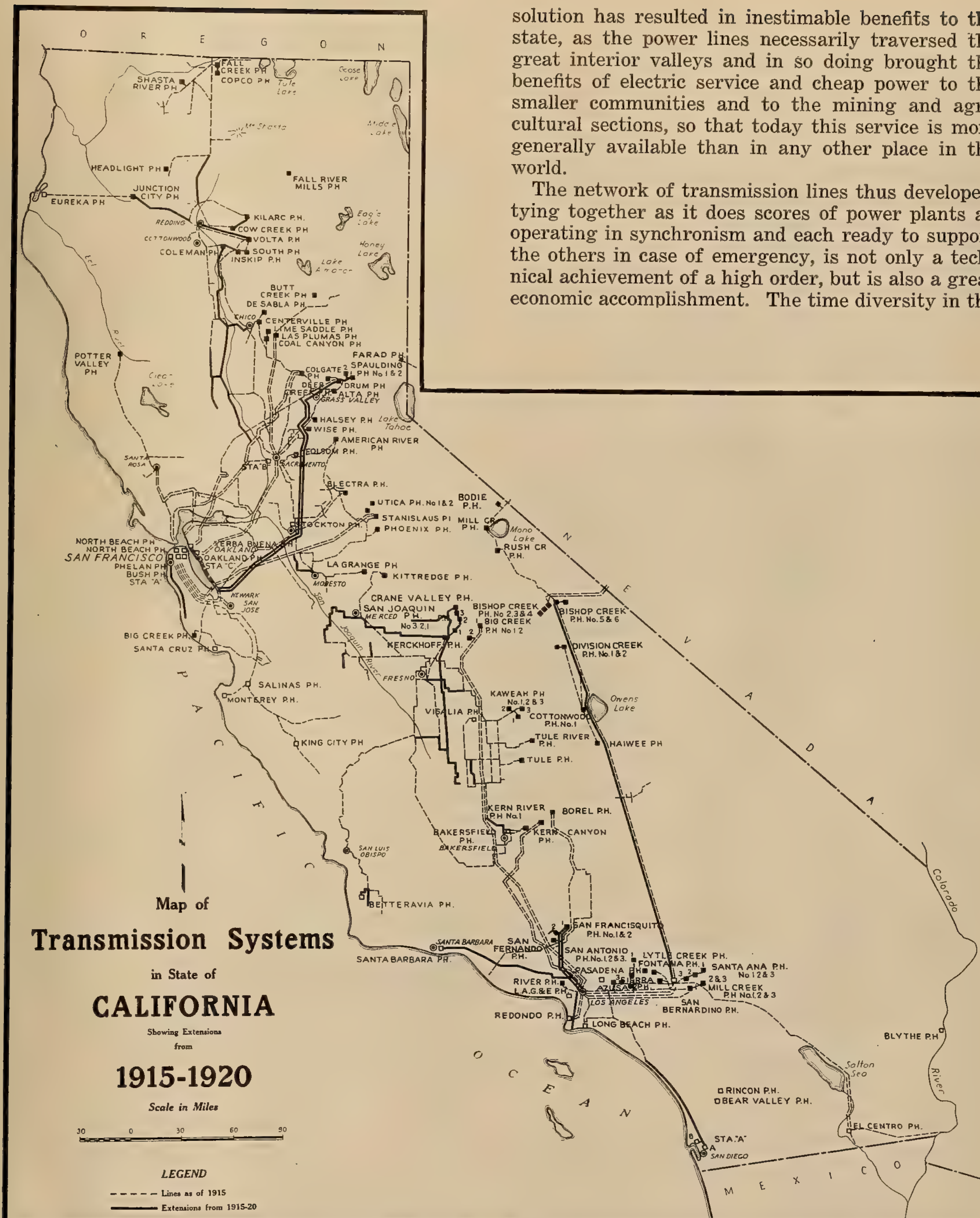
Southern California Edison Company's 220-kv. Big Creek line showing standard insulator strings. (Upper shield ring shown on middle string has been removed)

With the exception of those of the Southern California Edison Company and the City of Los Angeles, all of the plants in Californa operate at a frequency

of 60 cycles. That portion of the Edison company's system which formerly was owned by the Mt. Whitney Power & Electric Company is also operated at 60 cycles, but the main part of its system and the plants of the City of Los Angeles operate at 50 cycles. Interconnections, however, have been established through frequency-changer stations between the Southern California Edison Company's system and San Joaquin Light & Power Corporation. The Southern Sierras Power Company and the San Diego Consolidated Gas and Electric Company.

Today the interconnections provide a physical continuity of transmission circuits between Vancouver, Wash., and Yuma, Ariz., a total distance of about 1,400 miles. With the closing of a 30-mile gap between Vancouver and Kalama, Wash., a continuous physical connection will tie together the Washington-Montana system with that of California and Oregon. This immense territory, then to be interconnected, will cover six far western states and connect the Mexican line with British Columbia. This connection will provide a continuous line from Yuma, Ariz., to a point beyond Billings, Mont., a distance of about 2,300 miles, which is equal to a straight-line distance from New York to El Paso, Texas.

It is not claimed that power from steam plants in Portland, Ore., is delivered to Yuma, but, by reason of the interconnection, load adjustments can be so distributed that Yuma is able to be supplied ade-



Map of
Transmission Systems
in State of
CALIFORNIA
Showing Extensions from
1915-1920

solution has resulted in inestimable benefits to the state, as the power lines necessarily traversed the great interior valleys and in so doing brought the benefits of electric service and cheap power to the smaller communities and to the mining and agricultural sections, so that today this service is more generally available than in any other place in the world.

The network of transmission lines thus developed, tying together as it does scores of power plants all operating in synchronism and each ready to support the others in case of emergency, is not only a technical achievement of a high order, but is also a great economic accomplishment. The time diversity in the

quately even when the local supply is entirely inadequate.

Diversity and Load Factor

As stated before, the problem presented to the pioneers was to transmit the water powers of the Sierra to the Coast cities where the power markets were situated. The existence of this problem and its power requirements of the great variety in the classes of load supplied has been taken advantage of to a maximum degree. The plant capacity which is used to supply the lighting peaks of the cities in the winter is used for reclamation pumping in another section in the early spring, for irrigation pumping in the late spring and early summer, and again for

operating the fruit-icing plants and canneries in the late summer.

An analysis of the various kinds of load carried by the companies of California shows a somewhat different ratio of classes of business than that connected to large Eastern public utilities. Taking the Pacific Gas and Electric Company as typical, there is found for the year 1924 a sharp evening peak of 343,701 kw. occurring Dec. 19, with a daily load factor of 67 per cent. This peak was due to the overlapping of lighting and transportation demands with industrial uses. However, on July 29 of the same year there occurred a morning peak of 337,069 kw., which was not sharp like the one in December but continued for 1½ hours and gave a daily load factor of 79 per cent. The diversity thus becomes progres-

sive so that on many of the large systems the annual load factor is as high as 65 per cent. It was this high load factor which surprised and interested Dr. Steinmetz when he visited California shortly before his death.

Plant Factor

The report on "The Superpower System for the Region Between Boston and Washington," prepared for the United States Government by W. S. Murray and others in 1921, stated that all of the plants as operated in 1919 had an annual capacity factor—that is, the average load on all plants expressed as a percentage of the total capacity of the plants for the Boston-Washington region—of 26 per cent, and that, under the superpower system which was proposed, the annual capacity factor for the same region in 1930 was estimated at 45 per cent.

In 1923 the annual capacity factor of all plants in the state of California was about 45 per cent as compared with the 26 per cent for the Boston-Washington region or 1.73 times as great. In other words, it may be said that the dollars invested in generating plants in California are working 73 per cent more hours during the year than the dollars similarly invested in the Boston-Washington region, and this ratio would be even higher were it not for the fact that, due to the long dry season, it is necessary to have a considerable installation in steam standby plants, which are, in a sense, a duplication of the installation in hydroelectric plants. The practical effect of this difference in plant factor is that all costs which are not a function of the number of kilowatt-hours produced—and this will include interest, depreciation, taxes, insurance and to a degree maintenance and operating expenses—may be spread over 73 per cent more kilowatt-hours, thus reducing by 42 per cent the share of these costs chargeable to each kilowatt-hour.

Conclusion

While the foregoing is a very condensed account of the development of the interconnected transmission system of California, it is hoped that it will serve to convey, at least in a general way, an understanding of the problems encountered, the resourcefulness and courage of the pioneers, as well as some comprehension of the beneficial results which have accrued to the entire state by their efforts and those of their successors. For, as has been stated, the technical achievements have resulted in immeasurable economic benefits to the state and its people in that the power of its mountain streams has been made available not only to the cities and towns but to the mining and agricultural sections as well, and furthermore, as a result of the high load factor and plant factors obtained by the regional systems, taking advantage of the load diversities, economies in operation and investment have resulted in low rates for service.

Miles of Transmission Line, Principal Hydroelectric Plants, and Installed Plant Capacities in California, Dec. 31, 1924

	Miles of Line							Principal Hydroelectric Plants (2,000 kw. and over)	Number of Plants		Total Installed Capacity	
	20 kv. and under 33 kv.	33 kv. and under 60 kv.	60 kv. and under 100 kv.	100 kv. and under 165 kv.	165 kv.	220 kv.	Total		Hydro	Steam	Hydro	Steam
Pacific Gas and Electric Company	157	...	2,039	607	...	262	3,065	Alta, Bullards Bar, Centerville, Coleman, Colgate, Deer Creek, De Sabla, Drum, Electra, Folsom, Halsey, Inskip, Kilarc, Lime Saddle, South Spaulding 1, Volta, Wise, Hat Creek 1 & 2, Pit 1, Spring Gap, Stanislaus...	27	4	317,975	142,000
Southern California Edison Company	90	...	1,203	.....	...	535	1,828	Big Creek 1, 2, 3, 8, Borel, Fontana, Kaweah 3, Kern River 3, Tule, Mill Creek 3, Santa Ana 1	21	4	278,150	150,450
San Joaquin Light & Power Corporation	170	...	881	208	...	...	1,259	Canyon, Kerckhoff, San Joaquin 1, 2 & 3, Tule River	11	3	86,600	54,050
Great Western Power Company	350	170	.....	180	196	...	896	Big Bend, Caribou	2	6	131,000	30,800
The Southern Sierras Power Company	...	14	664	.....	...	..	658	Adams Auxiliary, Adams Main, Bishop Creek 2, 3, 5 & 6, Leevining Creek, Mill Creek, Rush Creek	12	...	62,558	....
Western States Gas & Electric Company	12	...	305	.....	...	...	317	American River, El Dorado, Junction City	3	2	26,650	9,250
City of Los Angeles	*	160	.....	91	...	...	251	Franklin Canyon, River Power, San Fernando, San Francisquito 1 & 2	9	...	70,050	....
The California Oregon Power Company	...	119	127	.....	...	...	246	Copco, Fall Creek	4	...	28,510	....
Midland Counties Public Service Corporation	...	...	172	.....	...	...	172		...	...	....	....
Coast Valleys Gas & Electric Company	90	75	.....	.....	...	...	165		...	3	....	1,375
San Diego Consolidated Gas & Electric Company	...	...	107	.....	...	...	107		...	2	....	37,250
Snow Mountain Water & Power Company	...	107	.....	.....	...	...	107	Potter Valley	1	...	6,400	....
Miscellaneous	47	11	32	3	...	...	93		15	7	28,500	101,705
Total	916	656	5,510	1,089	196	797	9,164		105	31	1,036,393	525,380

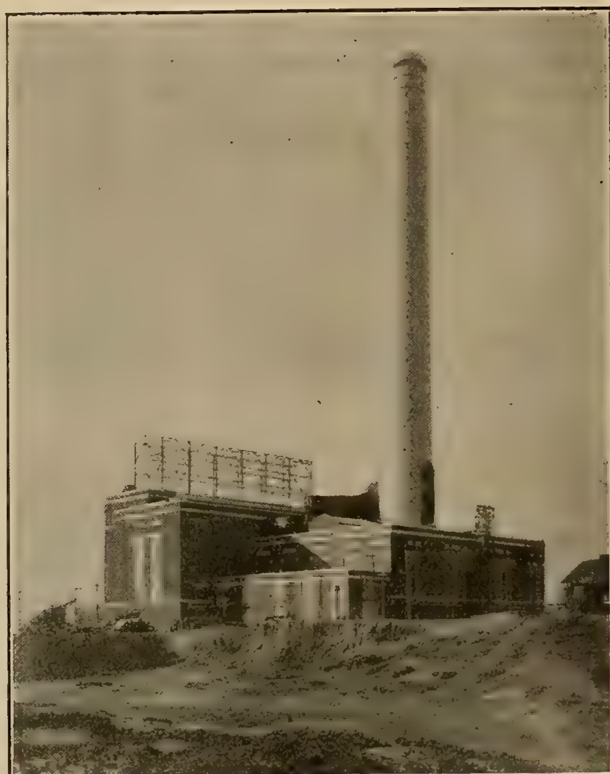
Total, 1,561,773 kva.

* 1922

The Seal Beach Power Station

By J. G. Rollow[1] and D. L. Galusha[2]

THE Seal Beach power station of the Los Angeles Gas and Electric Corporation is the second large modern station to go into operation recently on the Pacific Coast for generation of electricity by steam prime movers. The other is the Long Beach No. 2 plant of the Southern California Edison Company, which was described in this Journal March 15, 1925. It is expected that many delegates will visit these plants either before or after the convention, since they are both located near the city of Long Beach and only six miles apart.



The Seal Beach steam plant designed and erected by Dwight P. Robinson & Company, Inc., for the Los Angeles Gas and Electric Corporation embodies many novel features. The present rated capacity of the station is 30,000 kw. with provisions for an additional unit of the same capacity. The ultimate capacity of the plant is 200,000 kw.

The Seal Beach location, situated about thirty miles from the business center of Los Angeles, is east of Long Beach on Alamitos Bay, at a point where ample circulating water can be drawn economically from the bay and discharged into the ocean. Owing to the topography of the shore, existing ocean-front property developments and adverse water conditions, suitable sites are very limited. The site chosen is the nearest to the load of those considered acceptable under existing conditions.

The site is suitable for the expected ultimate development of 200,000 kw. The initial step consists of one turbine, having a nominal rating of 30,000 kw. at 80 per cent power factor, and three boilers each of 25,450 sq. ft. of heating surface. The actual capacity of the machine, on a conservative basis, as shown by tests, is 35,000 kw. at 80 per cent power factor, and it will be operated at that rating. There is room in the present buildiing for two such units.

The boilers are designed for an operating pressure of 375 lb. per sq. in. While higher pressures were considered, it was decided to adhere to this design, since operating characteristics, first costs and maintenance costs have not been established fully for the higher pressures, and reliability of service was of prime importance.

Some of the outstanding features of the plant are: (1) Low total cost of current inclusive of fixed charges. (2) High thermal efficiency. (3) Low investment cost per kilowatt. (4) Four-stage bleeding of turbines. (5) Air preheaters reclaiming heat from flue gases. (6) Condensate coolers for generators, transformers, turbine bearing oil and air ejectors. (7) Combination oil and gas firing. (8) Natural conditions of site utilized to avoid recirculation of condensing water and improved conditions at the intake. (9) House generator direct-connected to turbine shaft. (10) Automatic throw-over of auxiliary motors from one bus to the other when power fails on either. (11) Auxiliaries all electrically driven except one boiler feed pump and duplex drive exciters. (12) Buses at generator voltage eliminated. (13) Direct current eliminated except for excitation and control circuits. (14) High-tension equipment indoors.

Station Both Efficient and Economical

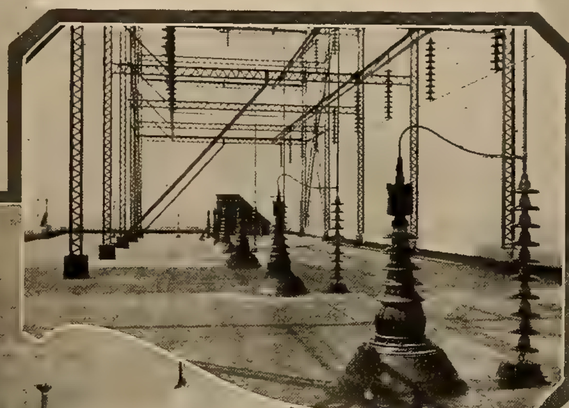
The policy underlying the design was to obtain the lowest total cost of current, inclusive of fixed charges, consistent with the high standard of reliability required by the Los Angeles Gas and Electric Corporation, which has built up its business on a reputation for reliable service. This policy required that all elements of design intended to increase thermal efficiency be analyzed carefully before adoption to insure that the maintenance and investment charges against them would not eat up the savings of higher efficiency. The extent to which this policy has been effective must be judged by the results. While the station has not been in service long enough to give operating records, an average thermal efficiency of approximately 15,000 B.t.u. per kw-hr. is indicated. The investment cost for the completed two-unit station, using the same unit prices for second unit equipment as obtained for the first, will be \$85 per kilowatt, based on the actual capacity of the units, viz., 35,000 kw. at 80 per cent power factor. This corresponds to \$100 per kilowatt for the nominal rating of 30,000 kw. at 80 per cent power factor.

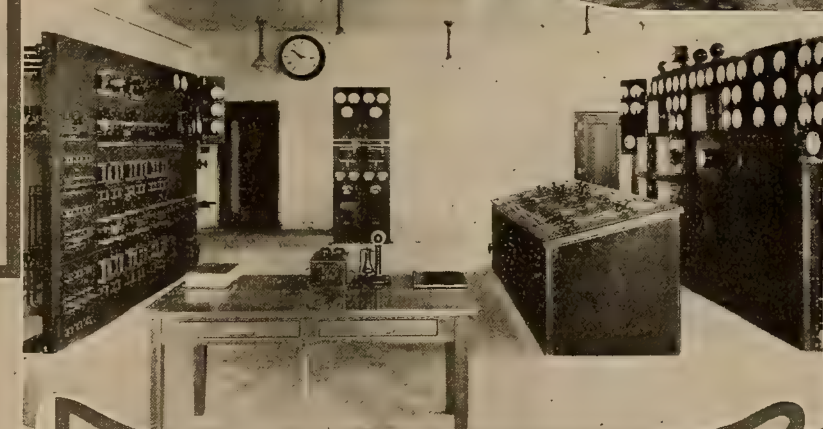
Bleeding and Preheating

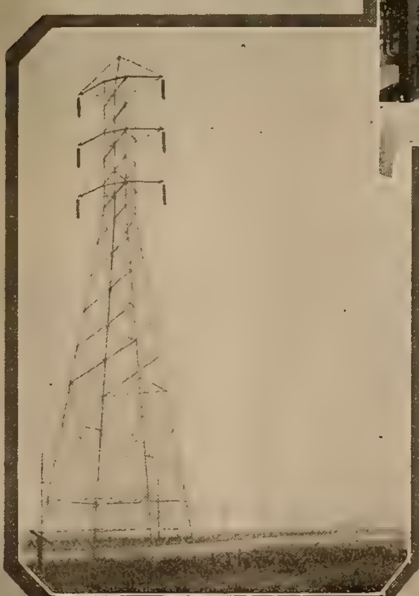
Four-stage bleeding and air preheaters were adopted after a thorough analysis of other available

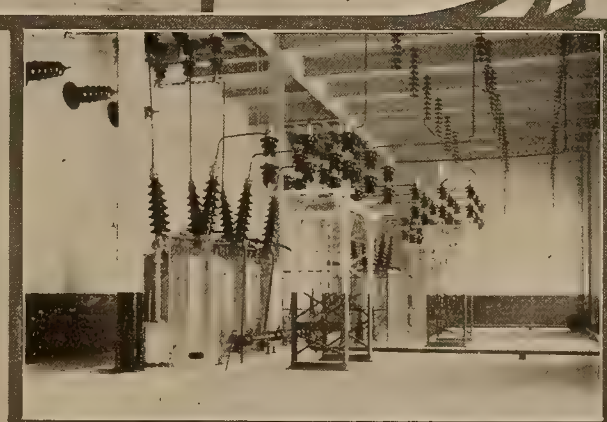
[1]Electrical Engineer, Los Angeles Gas and Electric Corporation.
[2]Consulting Engineer, Dwight P. Robinson & Company, Inc.

THE new Seal Beach station of the Los Angeles Gas and Electric Corporation is modern in every respect. At the left is a general view of the turbine room showing the first unit. Facilities have been provided in the present building for an additional unit. Below at the left is one of the 110,000/2,300-volt single-phase transformers. Next is a view of the control room showing the switchboards. Immediately below are the bushings for the outgoing 110-kv. lines. Owing to fogs all switching equipment is housed. Bottom left is a view of one of the suspension towers of the 110-kv. line to Los Angeles. Bottom right shows the 110,000-volt auxiliary bus room with oil and disconnect-switches. A two-circuit line carries the energy generated in the station to Los Angeles.

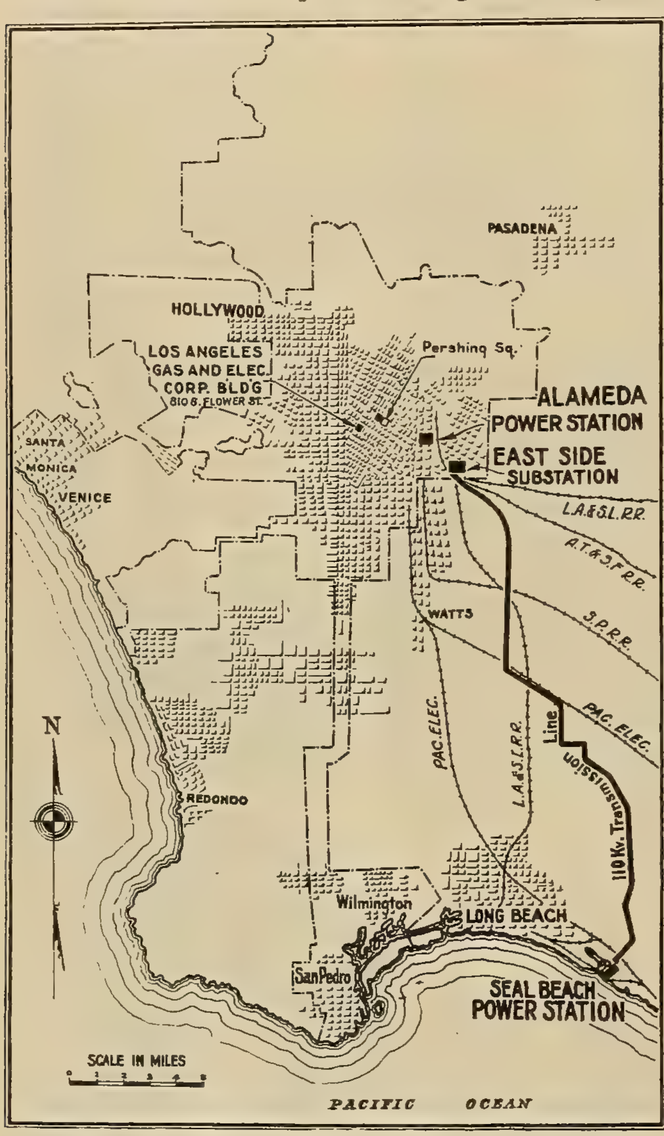








methods of obtaining heat balance and reclaiming flue gas losses. While there were no plants in service using four-stage bleeding at the time the decision was made, the engineers were convinced of its value. Since that time another plant using four-stage bleeding and designed by the same engineers has gone into service. The results have been better than the predictions, probably due to advancing the dew point further toward the exhaust with a resultant increase in low-pressure stage efficiency.



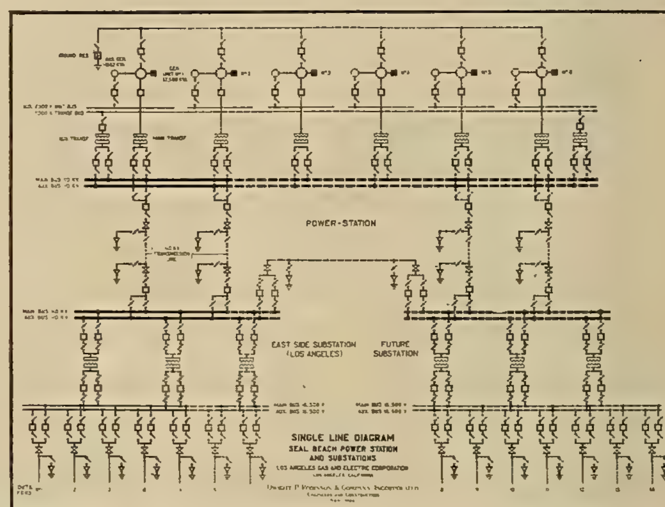
Map of Los Angeles and vicinity showing location of Seal Beach station, transmission line and new East Side substation

While the use of air preheaters shows only a small net return with present fuel costs, it was considered advisable to install them as an insurance for high operating efficiency under the higher fuel prices likely to prevail in the future.

Condensate flows from the hot well through the generator air coolers, transformer heat exchangers, turbine bearing oil cooler and condensers for the steam jet air pumps, in the order named. At full load about 25 deg. F. is added to the condensate temperature from recovered losses, but this is not a net saving as the bleeder heaters do somewhat less work. Aside from the small saving of heat units, the certainty that clean water is circulating in these important pieces of equipment is a distinct advantage for the method. For emergencies raw water can be used in place of the condensate.

Combination Oil and Gas Furnaces

Furnace equipment is designed for firing by either oil or gas. The burners are of the forced draft mechanical atomizing type, each boiler having two rows of seven each, so designed that the change-over in fuels can be made very quickly. One motor-driven variable speed fan per boiler draws the combustion air through the preheater and supplies the forced draft for the burners. Under the usual conditions the boilers will operate at less than 200 per cent of rating although provision has been made to operate at 300 per cent in emergencies. Extremely high ratings for oil-fired furnaces are not considered con-

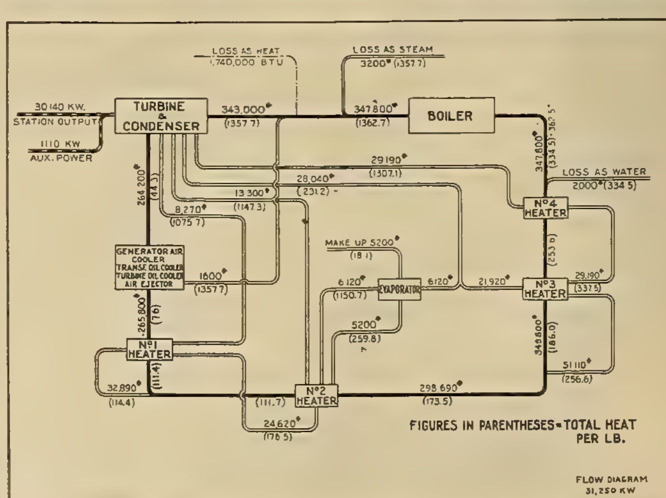


Single line diagram of Seal Beach station and substations in Los Angeles

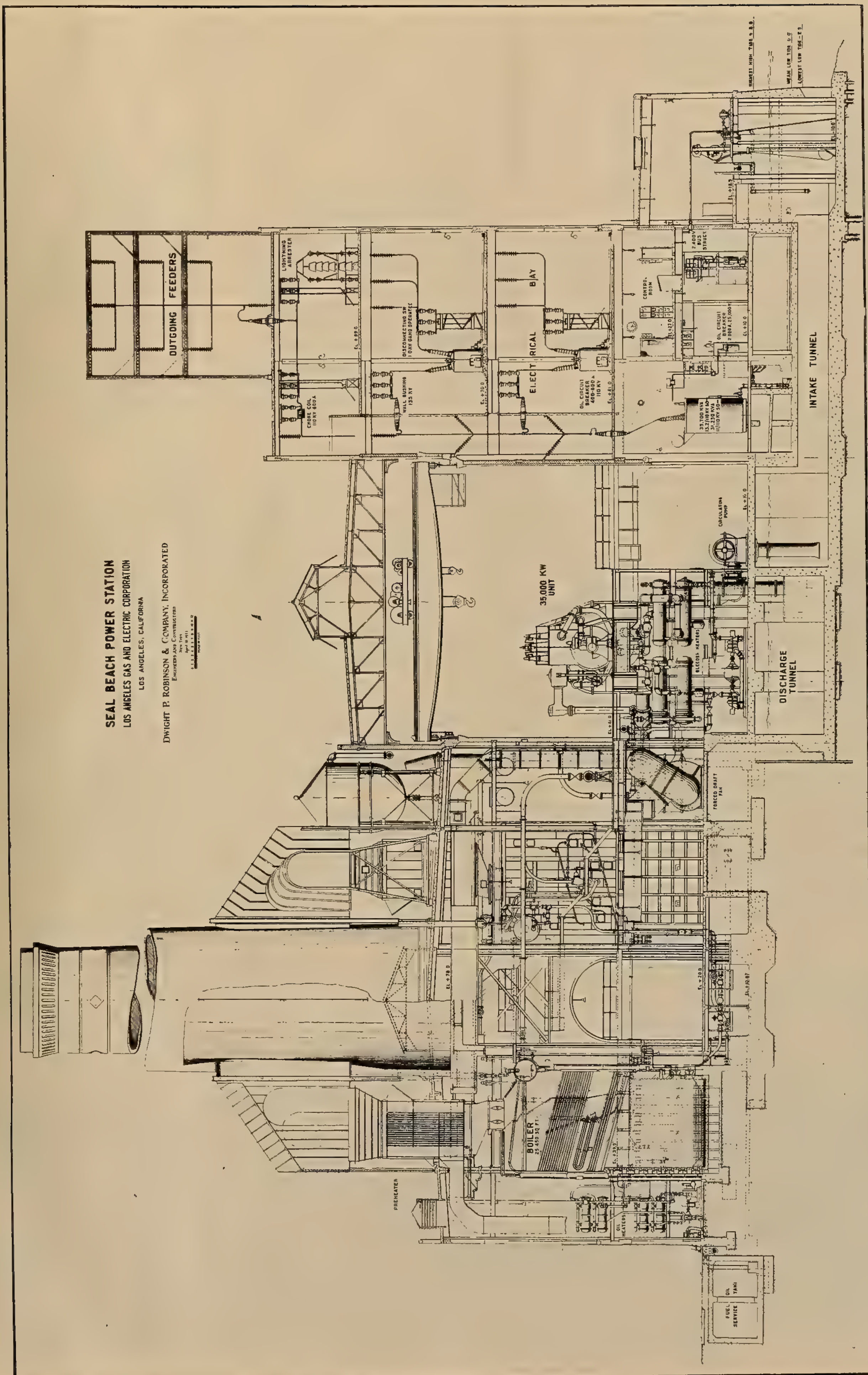
servative in the present state of the art, especially where maximum dependability is desired.

The natural advantages of the site have been utilized by placing the intakes on Alamitos Bay, which forms one boundary of the property, and discharging the circulating water directly into the ocean. The chance of recirculation thereby is reduced to a minimum. The location of the intake screens on the bay is also favorable from the point of view of the amount of debris to be handled.

The most important consideration for the major auxiliaries is reliability. Two prime sources of cur-



Heat flow diagram for one unit



Cross-section of 200,000-kw. Seal Beach station of the Los Angeles Gas and Electric Corporation. The present building has one 35,000-kw. unit installed and facilities for a second unit. The ultimate capacity of the plant is six units

rent for supplying the auxiliaries have been provided: one a house or auxiliary generator at 2,300 volts direct-connected to the main turbine shaft; the other a bank of transformers stepping down from the high-tension buses and supplied from either the main unit or the transmission lines. Means have been provided, in the way of a "flop-over" or "voltage-chaser," automatically to transfer the important auxiliaries, like circulating pumps, hotwell pumps, etc., from either source of supply to the other in case one goes dead.

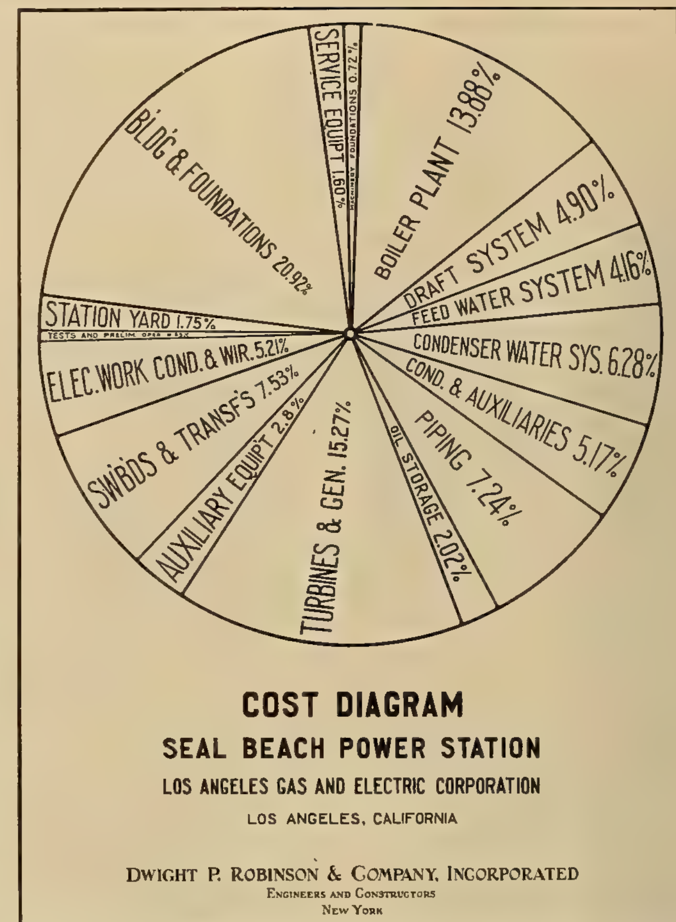
With the exception of one steam boiler feed pump and the duplex exciters which have both motor and turbine drives, all auxiliaries are electrically driven —the large motors at 2,300 volts and those below 75 hp. at 440 volts. The steam-driven units permit starting up a dead plant if outside power is not availble.

No Low-Tension Buses

The fact that all the power, except that used in the station itself, is used in Los Angeles, requires for economical transmission a relatively high voltage; 110,000 volts was adopted. Since this does away with all distribution at generator voltage, all buses at that voltage have been eliminated and the generators are connected direct to the step-up transformers through an oil switch. This switch is for synchronizing only and may be eliminated after further experience is had in synchronizing with high-tension switches. By this layout the design is simplified and the cost reduced.

Direct current is used for excitation and for the circuits controlling oil switches only, thus eliminating most of the converting equipment. Variable speed is required for boiler feed pumps and forced-draft fans. The former are driven by wound-rotor motors as only small variation is necessary, while the latter, requiring a larger speed range, connect to brush-shifting adjustable speed induction motors.

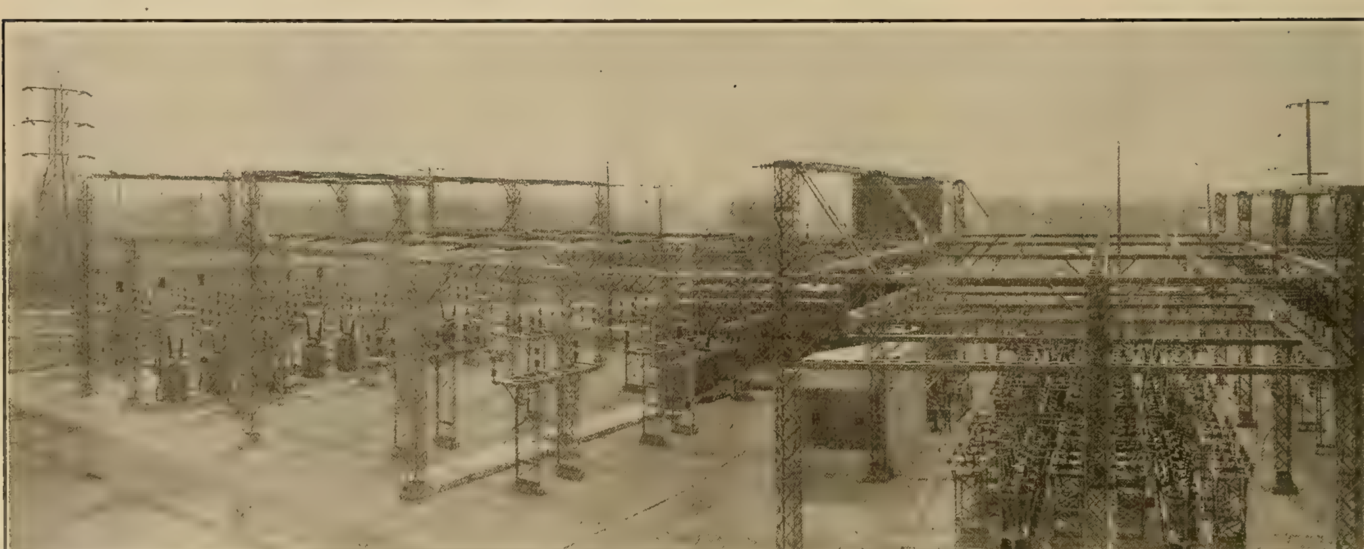
On account of the extreme severity of salt fogs, all high-tension equipment has been housed and the maximum reliability thereby secured. The accompanying cuts of photographs and drawings give an idea of the arrangement and connections. A detailed



Cost diagram. The investment cost will be $85 per kw. for the completed two-unit station

description of the plant, giving capacities of apparatus, manufacture, etc., will appear in a future issue of this Journal.

The Seal Beach plant was designed and constructed under the immediate direction of A. B. Day, vice-president and general manager of the Los Angeles Gas and Electric Corporation, assisted by H. J. Kister, manager of operation and construction, and J. G. Rollow, electrical engineer. Dwight P. Robinson & Company, Inc., acting as agent, has executed the work, including the transmission lines and substation connected therewith.



View of the East Side substation from the roof of the cooling tower

Rural Electrification in California

By Ben D. Moses[1] and George C. Tenney[2]

CALIFORNIA'S record in rural electrification is not approached in any other section of the country. Approximately 60 per cent of its farms receive electric service. Many factors have contributed to this achievement. In this article the authors discuss the progress which has been made to date and the work which is being done by the California Committee on the Relation of Electricity to Agriculture.

APPROXIMATELY 60 per cent of the farms of California receive electric service in one form or another from the lines of the various power companies of the state. This high average reflects quite conclusively the true progress being made in the application of electricity to California agriculture. Rainfall cannot be depended upon entirely for the satisfactory growing of the state's major crops, and as a consequence there has been a big development of artificial irrigation. Pumps have been installed for raising water from lakes, streams and wells and for the drainage of large areas after flooding. The U. S. census for 1920 showed that 295,672 acres were irrigated with water pumped from streams, 60,278 acres from streams by combined pumps and gravity, 826,846 acres with water pumped from wells, 23,561 from wells by combination flow and pumping and 4,168 acres by water pumped from lakes. The electric motor, furnishing as it does a dependable and efficient means of drive at a reasonable cost, has been adopted generally for driving these pumps.

The irrigation load has been sufficiently large to warrant the construction of rural extension lines, and this has made power available to the farmer for other purposes. Pumping also is a seasonal and peak load so that it has been to the advantage of the power companies to encourage other uses on the farm and to assist in the development of new applications so as to fill in the valleys in the load curve and to produce a higher load factor.

The farmer himself has not been slow to adopt the many conveniences that electricity affords, not only about the farm itself, but also in the home. The farmer with his demand and the power company with the supply form a good combination provided the connecting link of cost to the farmer and revenue to the power company is reasonable. Lighting, agricultural power, and cooking and heating schedules, as well as rural-line extension rules, have been arranged by the California State Railroad Commission so as to assist in the economic solution of the problem. The alacrity of the farmer, the efficiency and dependability of the service, and the reasonableness of the schedules have resulted in a wide application. In the case of farm homes it is not uncommon to find houses with a connected load of 10 kw. or more.

A study of the rural operations of the power companies of the state now is being made by the California Committee on the Relation of Electricity to Agriculture. When this survey is completed there will be a record of the number of agricultural consumers using electricity for lighting, for heating and cooking and for agricultural power. The statistics also will show the number of farmers receiving central-station service, the total number of miles of rural extensions, the annual agricultural consumption, and the revenue from this load. When available, these results will be published in the Journal of Electricity.

It is felt that the information to be derived from this study will aid not only the California companies in the extension of their agricultural operations but also will be of great assistance to companies in other sections of the country where efforts are being made to establish rural service.

The California Committee on the Relation of Electricity to Agriculture, in order to carry out its studies, has divided its work into two general classifications, "domestic" and "production." The object of electricity in the first case is to reduce the drudgery and increase the comfort in the farm home, and in the second to increase production, reduce operating costs and improve the quality of the product upon the farm itself.

TABLE I—What the Farmer Wants to Buy

(After each item is the percentage of farmers out of the total group who desired that particular one. The items are arranged in order of preference.)

Water systems	10.2 per cent
Radios	9.2 per cent
Washing machines	6.6 per cent
Lighting systems	6.5 per cent
Incubators	6.1 per cent
Oil stoves	5.2 per cent
Kitchen cabinets	5.2 per cent
Heating systems	4.3 per cent
Cream separators	4.3 per cent
Motor trucks	3.4 per cent
Tractors	3.4 per cent
Vacuum cleaners	2.7 per cent

Electricity has proved a boon to the farm housewife, and she has been quick to recognize the convenience and practicability of the many appliances. Its popularity is indicated by the results of a recent survey conducted by one of the national farm magazines. Farmers were asked to specify the equipment most desired in their individual cases. The first four items (see Table I) are typically domestic, and seven of the thirteen are electrical. It must be remembered also in connection with the table that the

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[1] Executive Secretary, California Committee on the Relation of Electricity to Agriculture.
[2] Managing Editor, Journal of Electricity.

survey was national in scope and does not apply specifically to California conditions. As further evidence of the favor with which electrical appliances are received in the home, the Electric Cooking and Heating Committee of the Pacific Coast Electrical Association estimates that there are 21,000 electric ranges in the homes of California and that about 8,000 of them are in farm kitchens. One of the larger power companies reports that 90 per cent of the ranges on its lines are on farms.

It may be stated with assurance that few of the homes within reach of central-station service do not have electric lights, a washing machine, vacuum cleaner, iron and other appliances. Seventy-five per cent of the farms in the state have running water,

	ELECTRIC MOTOR USED FOR	TOTAL No	TOTAL H.P.		ELECTRICAL HOUSEHOLD APPLIANCES	No.		ELECTRIC LIGHTS	No.
1	Irrigation			20	Range		38	Residence Lights	
2	Water Supply			21	Hot Water Heater		39	Barn Lights	
3	Feed Cutter			22	Washing Machine		40	Shop Lights	
4	Silo Filler			23	Space Heater (Stove)		41	Dairy Lights	
5	Shop			24	Sewing Machine		42	Pump House Lights	
6	Wood Saw			25	Vacuum Cleaner		43	Poultry House Lights	
7	Milking Machine			26	Flat Iron		44	Yard Lights	
8	Cream Separator			27	Mangle		45	Garage Lights	
9	Refrigerator			28	Percolator		46		
10	Dehydration Fan			29	Toaster		47		
11	Ventilator Fan			30	Waffle Iron				
12				31	Table Grill (Stove)			MISCELLANEOUS	
13				32	Curling Iron		48	Electric Truck	
14	Total Number Motors			33	Immersion Heater		49	Horse Clippers	
15	Total H.P. Connected Load			34	Heating Pad		50	Sheep Shears	
16				35	Dish Washer		51	Brooder	
17	Number Acres Farmed			36	Portable Fan		52	Incubator	
18	Major Crop			37	Bell Transformer		53	Battery Charger	
19									

Other Uses and Remarks

CARD No. 28

Facsimile of postcard questionnaire being sent out to all rural consumers by the California power companies

and in many cases the water is furnished by automatic electrically driven pumps.

Household refrigeration is a new use that is being developed. The farmer wants a satisfactory system of cooling that he can afford both to buy and operate. These plants must be reasonable in price, have low operating costs, and be sufficiently substantial that depreciation will be low. As with other appliances, service is going to be the prime requisite.

The exact extent to which electricity is used in the farm household, as well as on the farm itself, will be known when a survey now under way is completed. A sample of a postcard questionnaire which is being sent by the power companies to all rural consumers is shown in an accompanying illustration.

Considerable interest has been aroused in better farm home lighting by a portable demonstration given by the University of California Agricultural Extension Division. An exhibit has been prepared and talks are given by a department specialist before farm-center meetings. The assembled exhibit is shown in an accompanying illustration.

In order to understand how electricity is serving the California farmer from a production standpoint it is necessary to investigate the various applications. Pumping was not only the first but is also the most general application of power. A. G. Wishon, of the San Joaquin Light & Power Corporation, claims the honor of having installed the first irrigation motor on a farm in the San Joaquin Valley 25 years ago. It is estimated now that in excess of 900,000 acres of land are irrigated by electric power in the state, and that the number of agricultural power users is approximately 37,500. Practically all of these are customers using electric motors to drive pumps. Studies made by an individual power company of motor performance in 2,000 pumping plants showed that the average capacity of each irrigation motor was 12.5

Irrigation pumping plant in the San Joaquin Valley. By pumping into a reservoir the farmer is able to maintain a better load factor and use a smaller motor because the plant can operate 24 hours a day.

hp., the average water lift was 40.7 ft. and the average amount of water delivered by each plant per season was 198.7 acre-ft. This water cost the farmers on an average of $1.29 per acre-ft. A map of a typical farming area showing the number and location of pumping plants is presented in an accompanying illustration.

Some power companies of the state are working with the farmer in improving pump performance and cutting down pumping costs by conducting pump-testing departments. Tests are run for the farmer that show the efficiency of his pumping plant, and suggestions are made for improving this efficiency if it falls below the proper standard.

Eggs being inspected before being placed in electric incubators at the Must-Hatch Hatchery at Petaluma, the largest in the world

TABLE II—Preliminary Results of Tests of Electric Brooders

GENERAL				CHICKENS		BROODER			HOUSE				RESULTS		
Test no.	Business*	Location†	No. acres	Total No. in flock	No. baby chicks	Number	Type‡	No. chicks	Type	Size rooms in (ft.)	Runways	Exposure	Total hrs.	Total kw.-hr.	Watts per chick per hour
1	P	Pet	5	15,000	7,600	24	N	300	Shed	12x14	Field	S	672	257.0	1.275
2	P	Pet	5	15,000	7,600	24	N	400	Shed	12x14	Field	S	672	187.2	.696
3	P	Pet	5	15,000	7,600	24	N	400	Shed	12x14	Field	S	672	152.3	.5666
4	P	Pet	5	15,000	7,600	24	N	400	Shed	12x14	Field	S	672	212.0	.7887
5	P	Pet	5	15,000	7,600	24	N	None	Shed	12x14	Field	S	672	293.0	.....
6	P	Pet	20	25,000	.....	..	N	400	Gable	.....	.....	..	480	101.5	.5286
7	N&P	SR	90	5,200	3,000	6	N	1,200	Gable	15x16	Field	..	552	49.0	.074
8	N&P	SR	90	5,200	3,000	6	N	1,200	Gable	15x16	Field	..	552	49.0	.074
9	Far	SR	60	4,000	2,600	3	N	900	Shed	14x16	36x50	NE	552	118.5	.238
10	Far	SR	60	4,000	2,600	3	N	900	Shed	14x16	36x50	NE	552	155.0	.312
11	F&P	SR	20	6,000	3,000	3	G	950	Gable	18x22	Yard	S	528	383.0	.763
12	P	Seb	5	......	......	..	N	175	Shed	8x12	8x50	E	528	63.0	.682
13	F&P	H	60	3,000	2,000	2	G	1,000	Shed	16x20	Yard	S	...	.....	.....

*P=Poultryman; N=Nut grower; Far.=General farmer.
†Pet.=Petaluma; SR=Santa Rosa; Seb.=Sebastopol; H=Healdsburg.
‡N=Non-glowing; G=glowing or radiant.

Electricity is making rapid strides in its application to the poultry industry, because of its facility for automatic control, its cleanliness, its uniformity and its low fire hazard. Practically all of the chickens hatched on a large scale in California today are produced in electric incubators. Electric brooding has become sufficiently popular so that two large concerns are now building electric brooders and the poultryman is finding that the same advantages that applied in the case of electric incubation apply to electric brooding. The one notable objection—the possibility of an interruption of service which might prove harmful to the brood of chicks—is becoming relatively unimportant because of the dependable service being rendered by the power companies. Many of the troubles experienced in the early designs of electric brooders rapidly are being overcome by proper ventilation.

Hens in an electrically lighted poultry run. Lights are used during winter months to increase egg production

Tests made by the California Committee on the Relation of Electricity to Agriculture show that electricity for operating brooders under California conditions is from 50 to 75 per cent cheaper than other types of fuel. These tests show that it costs from one and one-half to two cents to brood a chick electrically over a period of six weeks. Table II shows preliminary results of tests conducted on thirteen different electric brooders in the Petaluma-Santa Rosa poultry-raising district.

The use of artificial lighting during winter months to increase egg production when prices are high is so common that it is felt that this field needs little further study. Needless to say, many of the large poultry farms have equipment of this character, and some of the farmers have developed this application even to the extent where dimmers are used on the lights in the evening to simulate the approach of dusk, it having been found that when the lights were turned off suddenly and the hens left in the dark they were so confused that many would fail to get on the roosts. Time switches are used for turning on and shutting off the lights.

The portable home lighting exhibit used by the University of California Agricultural Extension Service for giving talks before farmers on better home lighting

A 3-hp. motor driving a compressor which operates three milking-machine units

The problem of cleaning the chicken houses is one that may lend itself to the application of heavy-duty

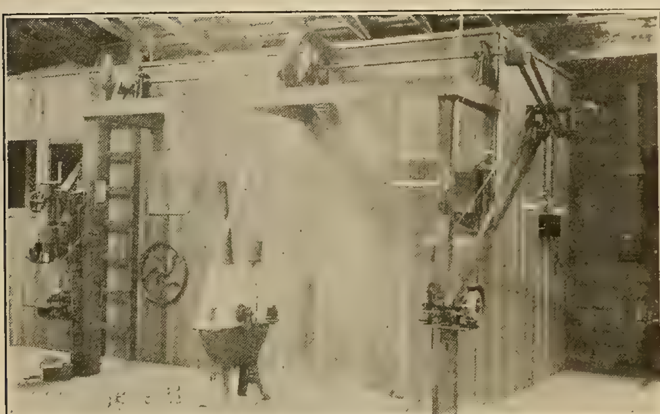
TABLE III.—Tests of Electric Spray Rigs.

Items	Test Number								
Tabulated	*1	2	3	**4	5	6	7	8	9
Size ranch, acres	30	260	250	56½	50	40	50	130	130
Number trees	2,270	20,200	22,000	4,300	5,000	4,000	5,000	10,100	10,100
Age trees—yrs.	5 to 40	2 to 20	15 to 34	3 to 60	23	35	23	2 to 20	2 to 20
Spacing trees—ft.	24x24	20x20	20x20	16x16	16x24	16x20	16x24	20x20	20x20
Pump location	Corner	Center	Center	Corner	Corner	Side	Corner	Center	Center
No. pump cyl.	3	4	3	3	3	3	3	3	4
Bore—in.	3	3¼	3¼	3¼	3¼	3	3¼	3¼	3¼
Size of motor	15 hp	7.5 hp	10 hp	35 hp	10 hp	5 hp	10 hp	7.5 hp	7.5 hp
Trees sprayed per acre	75.6	109	109	170	114	136	114	109	109
Trees sprayed per day	756	2,020	2,200	1,230	1,000	800	1,000	1,444	1,444
Acres sprayed per day	10	18.5	20.2	774	878	5.88	8.78	13.24	13.24
Trees sprayed per hr.	84	202	220	123	100	80	100	144.4	144.4
Acres sprayed per hr.	1.11	1.85	2.02	.774	.878	.588	.878	1.324	1:324
Trees sprayed per man per hr.	14	6	8:75	20	20	26	20	9.0	9.0
Acres sprayed per man per hr.	.185	.308	.33	.138	.175	.196	.175	.147	.1475
Load power factor	34.0	80.0	74.0	54.1	80.9	74.8	80.9	81.5	80.7
Horse power used	4.10	5.68	4.63	12.01	8.48	3.17	9.36	7.29	8.24
Cost system per acre	$58	57.70	40.00	106.30	37.50	....	37.50	57.70	57.70
Cost per tree	$.767	.53	.367	.625	.320	....	.320	.53	.55

*Designed for 150 acres. Installation not complete.
**Uses large irrigation motor in same pump house. Initial cost high due to large motor and remodeled plant.

vacuum cleaning apparatus such as is used in hotels. The poultry men are waiting to be shown whether this equipment can be applied successfully.

In the orchards of California electricity is finding new uses aside from pumping. One of the most recent developments is stationary spraying. Nine installations covering approximately 1,000 acres have been studied by the committee. Facts discovered in these studies show that the orchardist can spray under adverse ground conditions and that the ability to spray promptly and quickly is an important factor in the "bringing in" of his crop. Installation costs average approximately $55 per acre and are as low as 30 cents per tree. Motors range between 5 and 10 hp. for this service. The use is seasonal, but since it precedes the irrigation load it gives a better general load factor for the farm. While the committee has no definite figures on operating costs as yet, the indications are that spraying with this type of equipment will be comparatively low. Table III gives the results of studies of this subject to date.



A farm shop of the type recommended by the committee

A possible field of application which will require considerable study is the dehydration of fruits and nuts. Marked success has been experienced with oil-fired dehydrators, and one successful installation has been made with electricity furnishing the heat for the dehydration of walnuts. The problem is one of a design which will permit economic operation. The committee is making a tabulation of the physical properties of the various fruits and nuts which are dehydrated in the state, with an idea of having on hand data which will be of use in the design of electric dehydrators at some later date.

The California dairyman has found a number of applications of electric power in addition to his pumping requirements. Electric milking machines are being used successfully in many of the large dairies. Seven dairies where milking machines supplanted hand milking were studied by the committee, the herds varying from 20 to 420 cows and the milk production from 18.5 to 29 lb. per cow. The average energy consumption per day per cow was .076 kw-hr. The average cost of energy per cow per month was $.0455 on the basis of an energy rate of 2 cents per kw-hr. The average energy cost per 100 lb. of milk was $.0065. The results of this study are shown in Table IV.

In a recent survey made by the chief of the State Bureau of Dairy Control the majority of the district dairy inspectors stated that the thing most needed by the dairy industry at the present time was an electric sterilizer which would furnish sufficient hot water for washing pails and cans and sufficient steam

TABLE IV.—Tabulation of power requirements of electric milking machines on seven dairies.

Dairy No.	No. of units	No. cows per unit	No. of cows	Amt. milk per cow per day lb.	Elec. per day per cow kw.-hr.	Elec. per day per 100 lb. milk kw.-hr.	Elec. cost per cow per month	Av. milking time per cow per day in min.	Power cost per 100 lb. milk*
2	10 D	42	420	20.6	.033	.16	$.02	10.38	.32c
6	2 D	60	120	18.5	.050	.27	$.032	....	.54c
7	2 D	43	86	19.2	.038	.198	$.023	8.406	.39c
1	4 S	12	48	22.7	.075	.33	$.043	12.09	.66c
3	2 D	19	38	22.6	.0816	.36	$.048	12.76	.72c
5	2 S	14	28	23.8	.112	.47	$.066	....	.96c
4	1 D	20	20	29.0	.145	.50	$.087	15.34	1.00c
Average	......	......	......	23.2	.076	.327	$.0455	11.795	....

*Assuming a power cost of 2c per kw.-hr. which is about the average rate paid.

for sterilization. Manufacturers are having some success with the development of this type of equipment. Electric refrigeration is also a field for development in the case of the small dairies of the state. It is already widely used in the big dairies.

Spraying half a mile from the spray house where a motor drives the spray pump. The difficulty of using a portable rig can be realized when the height of the grass is noted

While the work of the committee has shown that the principal agricultural users of electricity, aside from the home, are the poultryman, the orchardist, the dairyman and the farmer requiring pumped water for irrigation, there are several miscellaneous uses for general farming which might be mentioned. The greatest need is for a portable motor between 5 and 10 hp. in capacity for utility purposes. If the problem of transmission of energy to various parts of the farm can be solved, the farmer can use a motor of this size which can be transported from place to place. Such a motor would cut down his initial investment in electrical equipment and decrease his demand charge because one portable motor would do the work of two or three stationary. In some instances he is holding down his demand charge by installing a double-throw switch for two motors used for different purposes.

Through its cooperation with the farm mechanics teachers throughout the state the committee is encouraging the construction of a modern and convenient farm workshop with an electric motor installed. One of the accompanying views shows a shop of the type recommended.

The committee has found that the farmer will use electricity where it will perform a service either better or cheaper than other forms of power or where it will improve the quality of the crop he is producing. The electrical industry in the past has looked upon the problem as one of education of the farmer. This is not the case in the strictest sense of the word. The problem of rural electrification seems rather to consist of—first, the education of the electrical industry to the needs of the farmer; second, education of the farmer to the possibilities of electricity; and third, cooperation between the farmer and the electrical industry in the production of proper machinery and its use.

Although rural electrification has developed in California faster than in other sections of the country, there is still much to be done, and there are many applications for the economical use of electricity. Mutual cooperation between the power companies, the manufacturers and the farmers will solve these problems to the advantage of all. The California Committee on the Relation of Electricity to Agriculture is working on these problems at the present time, fixing its attention not on generalities but upon specific applications. This work is expected not only to develop facts and information which will be of value to the electrical industry and farmers of California but also because of the extent of rural electrification in that state, to furnish data which will guide and assist the industry and the farmers in other sections of the country where steps are being taken to provide adequate electrical service to the farm.

Two types of electric brooders. The views on the left and in the center show the top and bottom, respectively, of a non-glowing or black heat type. The picture on the right shows the glowing or radiant type

General view of mill of Carlisle-Pennell Lumber Company, Onalaska, Wash., with log pond in the foreground

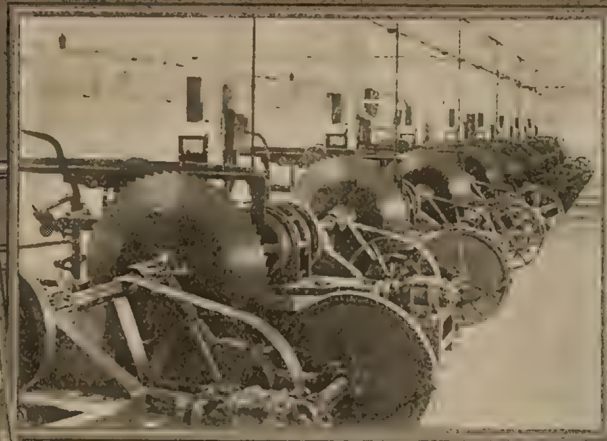
The Lumber Industry—A Potential Utility Load

By E. F. Whitney
Manager, General Electric Company, Portland, Ore.

IN recent years great advances have been made in the electrification of the lumber industry in the Northwest, but the bulk of the energy consumed in the production of lumber in this territory is generated by the mills themselves. The possibilities in the field are discussed here by a man who has made a study of the situation.

LUMBERING is one of the most important industries on the Pacific Coast and a particularly vital business to the northwestern states of Washington and Oregon. One-third of the country's reserve of standing timber lies in these two states, so it is but natural that the lumber production of these states must continue to increase at a rapid rate in order to supply the deficiency resulting from reduced production in the South, East and Middle West as the available timber stands of these districts become exhausted. Only a few years ago the total lumber production of Oregon and Washington was less than 6,000,000,000 ft. per year. In 1920 it was approximately 7,500,000,000 ft., and in 1924 it has been estimated at 9,500,000,000 ft.

The increase in the last four years has not been so rapid as was predicted. The remaining supply of southern timber, while diminishing, is not being exhausted at the rapid rate that estimates of five years ago indicated. This, in some measure, is due to the conservation program being followed by southern manufacturers. Some large operators of the South hope that, with their reforestation plans in complete operation, they will have practically a continuous timber-producing unit, and in fact, present indications are that the South will continue to be an important lumber-producing section for a number of years. However, continually increasing demands will be made on the timber reserves of the Northwest to supply the gradually diminishing



LOGS upon entering a sawmill first pass through the headrig. Above at the left is the head end of a mill showing trolley-driven log carriage, band head saw and the controllers for the live rolls. Top right shows a battery of ten upright shingle machines, each driven by one 10-hp. and one 3-hp. motor. At the left is a view of a pony trimmer in a planing mill driven by a 25-hp. motor. The operator, seated at the right, operates a keyboard which controls the battery of nineteen saws, which cut the planed boards into different lengths. The saws are raised and lowered by compressed air. Bottom left shows a 300-hp. motor direct-connected to a 14 x 72-in. edger in one of the large mills in the Northwest. Bottom right shows a 300-hp. motor direct-connected to double exhaust fans in a planing mill. One of the reasons for the adoption of electric drive in the mills is the fact that motors can be connected directly to machinery, thus doing away with costly line shafting. Most of the modern machines, as will be noted in the photographs, have unit drive.

production of other sections, and, as conditions require, the Northwest must expand its production to meet the trade demands of the world. This does not necessarily mean a large increase in the number of existing mills, but it does signify a greater production for existing mills and the addition from time to time of large milling units which will be erected by those lumbermen that transfer their scene of operation from other sections to the Northwest.

Ten to twelve years ago there was in operation a number of what would be considered today small-capacity mills. In 1910 a standard sawmill unit was assumed to have a capacity of about 100,000 ft. per day, or an annual production of 28,000,000 to 30,000,000 ft. Today the tendency is toward a smaller number of manufacturing units with the arbitrarily assumed standard mill producing probably 160,000 ft. per day, or 40,000,000 to 45,000,000 ft. per year. The trend therefore is toward larger manufacturing units, a smaller number of which will give greater production, and, of course, in general the larger the manufacturing unit the more efficiently will such units be designed and constructed.

Trend Toward Electrical Operation

A large mill cannot afford to use any other motive power than electricity. The first cost of a large electric mill is no higher and often is less than the first cost of a steam-engine, belt-driven mill of equal capacity. But a small mill with a capacity of 25,000 to 40,000 ft. per day cannot, as a rule, be built for electric drive as cheaply as a steam-driven mill. In both cases the first cost referred to covers the complete mill installation, including boiler plant in the case of steam drive and power plant in the case of electric drive. The reason for the higher first cost of the small electric mill is evident, but when such mill is located favorably within reach of central-station power, the necessity of a generating unit is removed and the electric mill can be constructed for as low a first cost as the steam mill.

Since the tendency in milling operations is toward larger units, and since in the larger units electric drive has proved economical, it may be said that the general tendency of the lumber industry is toward electric drive. In fact today every new modern sawmill is designed and built to use electric power practically without controversy as to the feasibility of using steam. Since the electric mill requires a supply of power which either must be generated by the mill or be purchased from available utility systems, the potentialities of load development in this field are increasing rapidly.

Possibilities from Central Station Standpoint

To produce and finish the 9,500,000,000 ft. of lumber estimated to have been manufactured in the Northwest in 1924 would require approximately 500,000,000 kw-hr. Of this total lumber production approximately 46 per cent was produced by the use of electric power, which leaves a possible load development of 270,000,000 kw-hr., the greatest part of which is available to existing lines of utility systems as potential additions to their present loads. This assumes, however, that none of the existing electric mills, a great number of which now generate their own energy, will be converted to the use of central-station energy, but I believe that in time a considerable portion of this present use of 230,000,000 kw-hr. will be supplied from the utility systems of the Northwest. The history of almost every sawmill is one of constantly increasing power demand, and when the limit of the present generating equipment of these mills is reached and additional load is added, the surplus can be taken care of most economically by central-station service.

Table of General Statistics on Lumber Industry

(Approximate Figures.)

Total production, Washington and Oregon, 1924	9,500,000,000 ft.
Distribution by districts showing principal producing centers—	
Oregon—	
Portland and Columbia River	1,641,165,000 ft.
Coos Bay and Coquille River	384,973,000 ft.
Klamath Falls	266,296,000 ft.
Washington—	
Seattle district	481,100,000 ft.
Tacoma district	1,059,835,000 ft.
Everett district	912,982,000 ft.
Bellingham district	409,300,000 ft.
Grays Harbor	1,261,600,000 ft.
Willapa Harbor	222,600,000 ft.
Total electrical energy required to manufacture entire production of these two states	500,000,000 kw-hr.
Per cent of total production electrified	46
Per cent of total number of mills electrified	9
Total electrical energy required to yard and load entire log production of these two states	145,000,000 kw-hr.
Per cent of total log production electrified	3.4

It is interesting to note that while approximately 46 per cent of the total lumber output of Oregon and Washington is produced with electric power, only about eight and a half to nine per cent of the total number of sawmills in these two states uses electric power, excluding a number of mills having only one or two motors installed for specific duty. The inclusion of these probably would double this percentage.

A study of the relative locations of these mills may be of interest. About 65 per cent of the total lumber production is contributed by mills located on tidewater and at or near the shipping centers, as Portland and the Columbia River, Coos Bay, Seattle, Tacoma, Everett, Bellingham, Anacortes, Grays Harbor and Willapa Harbor. All of these localities now have adequate utility service, and it will be a natural development that in time a considerable number of the mills located here will take advantage of the convenience and economy of central-station service. Of course it also happens that about 30 per cent of the mills in these same districts at present are electrified, but, nevetheless, a large percentage is still left as prospective profitable load.

Logging Presents a Large Field

The logs from which this lumber is produced must be gathered from their place of growth in forests and transported to the mills also by the use of power. This is almost a virgin field for load development. If all the logging operations of Oregon and Washington

possibly could be electrified for only that part of the work involving hauling the log from the place where it is felled and loading it upon the flat car, this alone would require about 145,000,000 kw-hr. per year. At present the electric logging in the two states uses about 5,000,000 kw-hr. per year, less than three and a half per cent of the total production being produced electrically.

It is estimated variously that there are some 2,000 logging engines in daily operation in these two states, of which only thirty are operated electrically. The situation in this department of the lumber industry is substantially the same as that in the sawmill branch of the business, in that the greater portion of the output is produced by a relatively few large operators. Again the situation is comparable in that the large operators can afford to electrify under conditions that would be prohibitive to the small operators. It is likewise true that when power is available a greater saving can be effected from electrification of logging operations than obtains from electrification of the sawmill. Logging operations, however, are usually located more remotely, and this fact, I believe, has militated against a more complete investigation of the possibilities of serving them electrically. But mere remoteness should not prevent a complete economic survey, because there is now before us an example of the electrification of a logging operation involving the ultimate construction of sixty miles of 66,000-volt line. This company, having determined upon a program of electrification, built thirty miles of this line as an initial installation, and the economies effected have justified fully a continuation of the program adopted.

Three Stages of Development in Electrification

From the beginning, the history of electric application to the different operations of the lumber industry has been the same as in many other industries. At first it was largely a question of convincing the manufacturers of the advantages of electric drive. This stage has been passed completely; but, as in a number of other industries, and particualrly so in the lumber industry, because some steam is required for a part of the manufacturing process and because mill refuse provides apparently cheap fuel, practically all installations made during the first stage generated their own power in isolated plants.

Then came a consideration of the actual cost of this power, and in many instances, particularly those more favorably located, central-station service was shown to offer economies and conveniences which made the installation of the lumber company's isolated plant seem inadvisable. We have entered this second stage. With the large possibilities of profitable loads facing the utility companies, and the necessity for reduced manufacturing costs that faces some mill operators coupled, in some instances, with the necessity of increasing the power supply, both will give more intensive study to this problem which in the past was assumed to have been answered correctly without controversy. This naturally will lead to the third stage, to which we can look forward confidently—to that time when electric drive already having been proved the most economical power, universal central-station service will be accepted as the most economical source except in instances in which certain extraordinary elements perhaps may operate in favor of the isolated plant.

Review of the Activities of the Commercial National Section

By W. R. Putnam

Chairman Commercial National Section, N.E.L.A., Vice-President and General Manager, Idaho Power Company, Boise, Idaho

DURING the present administrative year, July 1, 1924, to June 30, 1925, the Commercial Section of the National Electric Light Association has held three conferences—the first at Chicago, Aug. 26 to 28, 1924; the second at San Rafael, Calif., Nov. 19 to 21, 1924, and the third at New York City, March 17 to 19, 1925.

In order to secure better results from the work of the section and more active participation by the commercial men of the industry in this work, special efforts of the officers of the section during the year have been directed toward the following matters of policy:

First, to secure a better realization on the part of commercial men and the companies that the work of the Commercial Section is intended to produce more and better business for the companies;

Second, that active participation by commercial men in the work of the section cannot help but produce better business for the companies these men represent;

Third, that as much work of the section as possible be performed by the subcommittees of the geographic divisions, thus insuring a much wider participation by the commercial men;

Fourth, that each committee center its activities as far as possible upon a few major subjects within the scope of that committee, thus having a definite objective for the work of the year, rather than attempting to cover all phases of the subjects included in the scope of the committee.

Former standing committees of the section—appliance, electric cooking and heating, power, lighting, transportation, and customers relations—were continued, and new committees to take up electric domestic refrigeration, industrial street and highway

lighting, and radio, and a new subcommittee of the power committee on commercial cooking and heating, were appointed.

The electric cooking and heating committee, under the chairmanship of A. C. McMicken, sales manager, Portland Electric Power Company, Portland, apportioned its work among the geographic divisions, assigning to the Northwest Electric Light and Power Association committee, under the leadership of Lewis A. Lewis, sales manager, The Washington Water Power Company, Spokane, a study of the characteristics of electric range loads for the purpose of securing more definite information than is now available to show the investment required on the part of electric service companies for handling this load. A special study of water heating was assigned to the Pacific Coast Electrical Association committee under the leadership of R. C. Bragg, Vallejo Electric Light & Power Company, Vallejo, Calif. To the Great Lakes Division committee, C. O. Dunten, Central Illinois Public Service Company, Springfield, Ill., chairman, was assigned a study of the costs of servicing electric ranges; and to a a special committee, of which C. E. Greenwood, Edison Electric Illuminating Company, Boston, is chairman, a study of the possible changes in wiring requirements with a view to reducing the cost of customers' wiring for range installations.

The industrial lighting committee, with J. F. Becker, United Electric Light & Power Company, New York City, as chairman, has prepared all details for an intensive campaign to be conducted in all industrial centers during the fall of this year for the purpose of securing additional use of electricity for industrial lighting purposes by present customers. The thought underlying the appeal to be used in this campaign is that better and more adequate lighting will decrease accidents, decrease spoilage of goods, and increase the output per man.

The appliance committee, Thomas W. Berger, The Philadelphia Electric Company, Philadelphia, chairman, and T. L. Phillips, Union Gas & Electric Company, Cincinnati, Ohio, vice-chairman, has produced some very excellent studies showing, first, the increased kilowatt-hour sales resulting from the use of various appliances by residential customers, and, second, the kinds of campaigns necessary to merchandise appliances successfully.

The electric domestic refrigeration committee, G. E. Miller, Cleveland Electric Illuminating Company, Cleveland, chairman, reports on the consumption of refrigerators, the costs of servicing, merchandising problems, ice cream cabinets, and individual water-cooling systems.

The power committee, with V. M. F. Tallman, Charles H. Tenney & Company, Boston, as chairman, devoted special attention to competitive waste-heat installations, as well as to other forms of competitive power including diesel engines. It also has studied the kilowatt-hour consumption per unit of product in various industries, and, through a subcommittee on commercial cooking and heating under the leadership of A. M. Lloyd, Commonwealth Edison Company, Chicago, is preparing a most exhaustive report on the subject of industrial heating.

The transportation committee, B. J. Martin, Commonwealth Edison Company, Chicago, chairman, has centered its work principally upon giving more publicity, both among electric service companies and among prospective users, to the desirability of the electric truck for certain transportation requirements, and to securing more active participation of electric service companies in the promotion of electric truck sales.

The lighting committee, C. C. Munroe, Detroit Edison Company, Detroit, chairman, early in the year spent its time furthering the work of the home lighting educational committee, and has given special attention to home lighting and commercial lighting requirements.

The street and highway lighting committee, with E. W. Lloyd, Commonwealth Edison Company, Chicago, as chairman, realizing that the growth of this class of business had not kept pace with the growth of population, has made special recommendations as to how commercial organizations of electric service companies should proceed to secure their share of this business.

The customers relations committee, F. F. Kellogg, Duquesne Light Company, Pittsburgh, chairman, has continued the monthly service suggestions and has given special study to the problem of the responsibility of commercial men in seeing that good customers relations are secured and maintained by the companies.

Due to the active participation of so many commercial men in the industry in the work of the various committees, unusually good results have been secured and most excellent reports have been prepared. These will be helpful to any commercial man studying the problem of how to direct the commercial activities of his company so as to secure the best results.

The Economy of Electric Trucks.—Electric trucks are outstandingly the most efficient and economical means of transportation where the short-haul, many-stop problem as it exists in metropolitan areas is to be met. Hills and even sandy roads no longer are the bogey that they once were. Notwithstanding these and others facts and figures, development and operation, there are today only about 500 electric trucks in operation in the state of California while there are 10,000 draft horses in daily use in the two cities of San Francisco and Los Angeles alone. On the basis that the average truck will do the work of a team of two horses, this tells us that there is a potential field for 5,000 electric trucks in these two cities, to say nothing of the many other Pacific Coast cities and towns. The main thing which seems to be lacking is a recognition of the potential and logical sales and application field that actually exists and is waiting for someone to wake up to the fact. While this vehicle will undergo the normal development of the times along with the other machinery in use, the period of experimentation is over and a finished product awaits the potential user. Not only is the electric truck the best available means of solving the transportation problem mentioned above, but it is a most excellent off-peak load builder.

Snook O'Brien's Model Diversified Electrical Farm

By John W. Otterson
Associate Editor, Journal of Electricity

THE farm of Snook O'Brien—somewhere in the San Joaquin Valley of California was laid out to show, through statistics and a miniature reproduction of the hypothetical farm, the relation of the cost of electricity to the gross returns when a number of crops are being raised on one farm. By securing this diversification a smaller installation is possible, greater load factor is secured, and the peak demand is reduced considerably, to the benefit of central station and consumer alike.

FROM the standpoint of the central station the electrification of the farm presents two problems that must be solved before the most satisfactory results can be obtained for the company and the consumer. In the first place, the development of this class of business must be accomplished to warrant the line extensions that are necessary. In the second place, after the business has been secured, the aim of the commercial department is so to diversify the demand that the period of use will come as close to the full year as possible.

From the point of view of the customer, the question that arises is, "How may I produce the greatest yield with the least expense?" The answer to this question also is affected to a great degree by the two problems that confront the central-station, for with a large agricultural load of a diversified character with a high yearly load factor lower rates per unit of power can be offered to the consumer.

Using this analysis, it can be seen readily that the interests of the central station and the agricultural consumer are identical, namely, the extension of electric service in agricultural districts and the diversification of demand so that a moderate-sized installation, working practically the year around, may be used to furnish the necessary power for the farm.

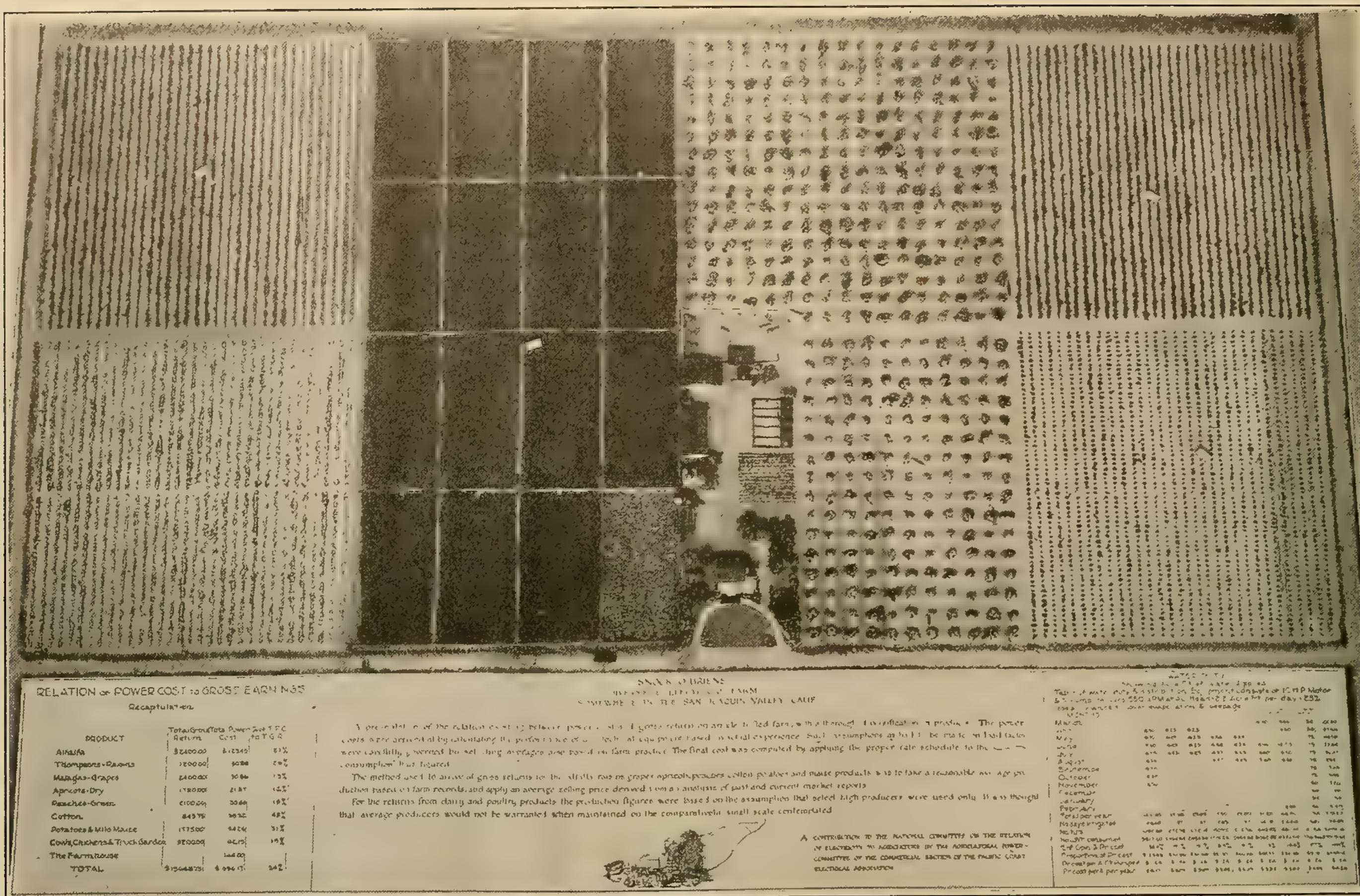
Looking toward the more extensive electrification of agricultural districts and the minimizing of the cost of power per unt of product, the agricultural power committee of the Commercial Section, Pacific Coast Electrical Association, at the suggestion of A. M. Frost, chairman of the section, has devoted considerable study to the problem. In its studies the committee reached the conclusion that to present the matter most forcibly to the agricultural consumer and the central-station commercial-department salesman, something more than the use of statistics would be necessary. The use of a model farm was considered, but it was agreed that such an exhibit presented without figures and facts thoroughly worked out would be of little value.

The aim of the leaders in the movement to prepare accurate statistics and visual data on the modern farm was so to present the information that it would be strikingly interesting to both the farmer and the central-station man. One of the reasons for the study was that it was deemed advisable to offer to the National Committee on the Relation of Electricity to Agriculture a comprehensive report on the relation of the cost of electricity to gross earnings from a model farm. This aim was one of the prime considerations in preparing the material which is to be contributed to the National Committee on the Relation of Electricity to Agriculture by the agricultural power committee of the Commercial Section of the Pacific Coast Electrical Association.

The plan finally adopted by the committee consisted in the preparation of a model farm, for which statistics and facts relative to the acreage, crop production, gross return and power costs were worked out. This model farm was laid out in miniature, using as the basis for the plan data collected over a period of years. The farm, considered to be located somewhere in the San Joaquin Valley of California, and known as "Snook O'Brien Diversified Electrical Farm," was so planned that by the diversified use of electrical energy, the installation would be kept running a great many months of the year; as a result Mr. O'Brien would get into the lower blocks of the agricultural power rate. On the model farm of Snook O'Brien it was possible to install a smaller plant than would have been necessary if the land had been planted to only one product. This was due to the fact that through the diversification of crops the irrigation season also is diversified as irrigation is not needed simultaneously by all of the crops. This procedure has a tendency to increase the load factor and to decrease the peak demand over that of the one-crop farm.

This increasing of the load factor and the decreasing of the demand is of course of vital interest to the central station for through these means the investment in plant capacity can be kept down, with the result that greater returns may be had on the capital invested.

In laying out the model farm of Snook O'Brien the crops to be raised in the various plots of the 80-acre diversified farm were decided upon after considerable study of the conditions existing in the San



The model of Snook O'Brien's farm is surrounded by the data shown in Tables I to X.

TABLE I.—Potato and Milo Maize Field, Field No. 1, 10 acres.

Average yield per acre	5 Tons potatoes 1½ Tons maize
Total yield	50 Tons potatoes 15 Tons maize
Selling price	$25 $35
Total return	$1775
Acre-ft. of water applied per year	44
Power cost per acre-ft.	$ 1.24
Power cost for water per acre per year	5.43
Total power cost per year	54.26
Percent of total power cost to total return	3.1

TABLE II.—Cotton Field, Field No. 2, 10 acres

Average yield per acre	750 Lb. seed ¾ Bale cotton
Total yield	3¾ Ton seed 7½ Bales cotton
Selling price	$25 $0.20
Total return	$843.75
Acre-ft. of water applied per year	31.2
Power cost per acre-ft.	$1.24
Power cost for water per acre per year	$3.83
Total power cost per year	$38.32
Percent of total power cost to total return	4.5

TABLE III.—Alfalfa Field No. 3, 20 acres

Average yield per acre	8 Tons
Total yield	160 Tons
Selling price	$15
Total return	$2,400
Acre-ft. of water applied per year	100
Power cost per acre-ft.	$1.25
Power cost for water per acre per year	$6.17
Total power cost per year	$123.45
Percent of total power cost to total return	5.1

Joaquin Valley. All of the crops suggested are being raised there at the present time and have been found well adapted to the country. Seven fields and a farmyard were included in the model layout, the fields being devoted to raising potatoes and milo maize,

TABLE IV.—Peach (Green) Orchard, Field No. 4, 10 acres

Average yield per acre	6 Tons
Total yield	60 Tons
Selling price	$35
Total return	$2,100
Acre-ft. of water applied per year	25
Power cost per acre-ft.	$1.24
Power cost for water per acre per year	$3.09
Total power cost per year	$30.86
Percent of total power cost to total return	1.5

TABLE V.—Malaga Grape Vineyard, Field No. 5, 10 acres

Average yield per acre	6 Tons
Total yield	60 Tons
Selling price	$40
Total return	$2,400
Acre-ft. of water applied per year	25
Power cost per acre-ft.	$1.24
Power cost for water per acre per year	$3.09
Total power cost per year	$30.86
Percent of total power cost to total return	1.3

TABLE VI.—Apricot (Dried) Orchard, Field No. 6, 7 acres

Average yield per acre	1¼ Tons
Total yield	8¾ Tons
Selling price	$200
Total return	$1,750
Acre-ft. of water applied per year	17½
Power cost per acre-ft.	$1.24
Power cost for water per acre per year	$3.05
Total power cost per year	$21.37
Percent of total power cost to total return	1.2

Thompson raisins. All of the fields with the exception of those set aside for alfalfa and the apricot orchard contained 10 acres each. The alfalfa field was twice the size of the others, and only 7 acres were set aside for the apricots.

After the crops to be raised on the Snook O'Brien farm had been decided upon, the engineering de-
cotton, alfalfa, peaches, Malaga grapes, apricots, and

TABLE VII.—Thompson Raisin Vineyard, Field No. 7, 10 acres

Average yield per acre	1½ Tons
Total yield	15 Tons
Selling price	$80
Total return	$1,200
Acre-ft. of water applied per year	.25
Power cost per acre-ft.	$1.24
Power cost for water per acre per year	$3.09
Total power cost per year	$30.86
Percent of total power cost to total return	2.6

TABLE VIII.—Farm yard, 3 acres

10 Cows		
150 Hens		
Vegetable and truck garden—		
Total yearly yield	6,250 Lb. butter-fat	
	3,000 Doz. eggs	
	$100 Garden truck	
Selling price	Butter-fat	$0.40
	Eggs	0.20
Total return	Butter-fat	$2,500
	Eggs	600
	Garden truck	100
		$3,200
Acre-ft. of water applied per year		7.5
Power cost per acre-ft		$1.24
Power cost for water per acre per year		$3.05
Power cost for	Milking machine, Separator, Sterilizer, Feed grinder, Yard lighting — per year	$53.03
Total power cost per year		$62.19
Percent of total power cost to total return		1.9

partment of the San Joaquin Light & Power Corporation prepared a model of the 80-acre tract, and laid out, to scale, the various fields. Miniature reproductions of the crops to be raised were placed in the fields, and in the approximate center of the acreage the farmyard was situated. In the farmyard were located the house, garage, tank tower, barn and implement shed, separator house, poultry runs, milking shed, cutting shed, pump house, and alongside of the yard the truck garden. Everything that was placed on the model was made to scale so that the miniature, which is 4 x 8 ft., gives the impression of an aerial view of the farm.

TABLE IX.—Relation of power cost to gross earnings

PRODUCT	Total gross return	Total power cost	Percent of power cost to gross return
Alfalfa	$2,400.00	$123.45	5.1
Thompson raisins	1,200.00	30.86	2.6
Malaga grapes	2,400.00	30.86	1.3
Apricots—dry	1,750.00	21.37	1.2
Peaches—green	2,100.00	30.86	1.5
Cotton	843.75	38.32	4.5
Potatoes and milo maize	1,775.00	54.26	3.1
Cows, chickens and truck garden	3,200.00	62.19	1.9
Farmhouse	....	144.00	...
Total	$15,668.75	$536.17	3.4

To present the information concerning the relation of the cost of electricity to the revenue of the farm, men from the San Joaquin Light & Power Corporation and others interested in this class of work in all branches of the electric power industry secured statistics covering the raising of the crops suggested as well as the costs of electricity needed. These data were compiled from averages as found in the San Joaquin Valley over a long period of years. The information secured dealt with the yields that might be expected, the average unit price, the acre-ft. of water needed to raise the crops, and the average cost for electricity for pumping the water. These data were secured for each crop, together with the amount of power and duration of the interval through which the power would be needed to raise the crops.

This information, covering the fields individually, was arranged in a series of tables to serve as a border for the farm itself. Tables I to VIII give the results as worked out for the seven fields and the farmyard. The gross returns from the various products raised were secured by taking a reasonable average production, based on farm records, and to this applying an average selling price derived from an analysis of past and current market reports. In figuring the returns from the dairy and poultry products, the production figures were based on the assumption that select high producers only were used, as it was agreed that average producers would not be practical on such a small scale.

The costs of operation for the pumping plant were figured on the regular agricultural power schedule for a 10-hp. motor. Under this schedule there is a demand charge for the year of $60. The energy charge is as follows:

1.4c per kw-hr. for the first 10,000 kw-hr. per year.
.9c per kw-hr. for the next 10,000 kw-hr. per year.
.7c per kw-hr. for the next 10,000 kw-hr. per year.
.6c per kw-hr. for all the remaining power.

The total power costs were calculated and then the costs were apportioned to each crop, according to the use as shown by the statistics secured from average installations of a similar nature. By comparing the total power costs with the gross returns for the va-

TABLE X.—Water duty on Snook O'Brien's diversified 80-acre farm

PUMP ELECTRICALLY OPERATED
10-hp motor—550 g.p.m.—2.2 acre-ft. per day—40-ft. head—25 percent loss allowance.

Months	Alfalfa 20 acres	Thompson vineyard 10 acres	Malaga vineyard 10 acres	Apricot orchard 7 acres	Peach orchard 10 acres	Cotton 10 acres	Potatoes and milo maize 10 acres	Truck garden, house, barn, milk sheds, etc. 3 acres	Total
Acre-ft. of water applied—									
March	....	....	....	....	....	16.0	6.3	.50	22.80
April	8.3	6.25	6.25	....	....	....	6.3	.50	27.60
May	16.7	6.25	6.25	4.38	6.25	....	....	.75	40.58
June	8.3	6.25	6.25	4.38	6.25	8.0	12.5	.75	52.68
July	16.7	6.25	6.25	4.37	6.25	3.6	6.3	.75	50.47
August	8.3	....	....	4.37	6.25	3.6	6.3	.75	29.57
September	16.7	....	....	....	....	....	....	.75	17.45
October	8.3	....	....	....	....	....	....	.75	9.05
November	16.7	....	....	....	....	....	....	.50	17.20
December	....	....	....	....	....	....	....	.50	.50
January	....	....	....	....	....	....	....	.50	.50
February	....	....	....	....	....	....	6.3	.50	6.80
Total	100.0	25.0	25.0	17.5	25.0	31.2	44.0	7.5	275.2
No. days irrigated	45.45	11.37	11.37	7.95	11.37	14.18	20.00	3.41	125.09
No. hours irrigated	1,090.80	272.76	272.76	190.92	272.76	340.32	480.00	81.84	3,002.16
No. kw.-hr. consumed	9,817.20	2,454.84	2,454.84	1,718.28	2,454.84	3,062.88	4,320.00	736.56	27,019.44
Percent of operation and cost	36.4	9.1	9.1	6.3	9.1	1 1.3	16.0	2.7	100.0
Proportion of cost	$123.45	$30.86	$30.86	$21.37	$30.86	$38.32	$54.26	$9.16	$339.14
Cost per acre per year	$6.17	$3.09	$3.09	$3.05	$3.09	$3.83	$5.43	$3.05	$4.24
Cost per acre-ft. of water	$1.24	$1.24	$1.24	$1.24	$1.24	$1.24	$1.24	$1.24	$1.24

rious crops it was possible to secure the per cent of the total power cost to gross earnings from each crop. The summation of this information is presented in Table IX. Unit power costs, including energy used for all purposes on the farm, average $0.0148 per kw-hr. Considering only the energy used for power purposes, the average price per kw-hr. is $0.01265.

Water-duty service data were made up also by taking the average of a large number of installations in the San Joaquin Valley. The total head as applied to the Snook O'Brien farm was taken as 40 ft., and the cost per acre-ft. of water was taken as $1.24. The amount of water needed was secured by taking the average as stated above. The 5-in. pump considered to be installed on the farm was equipped with a 10-hp. motor and was rated as capable of supplying 550 g.p.m., or 2.2 acre-ft. per day. An allowance of 25 per cent was made to cover evaporation and seepage. A presentation of the data is made in Table X. This tabulation shows the number of acre-ft. applied during the months of the year, number of days and hours irrigating was done, number of kw-hr. consumed, the per cent of the total operation and power cost assignable to each crop, the proportion of the power cost assessed against each crop that is chargeable to irrigation, the cost per acre per year for irrigation, and the cost per acre-ft. of water.

The Electrified Farmhouse

The home of Snook O'Brien's farm also has been equipped with a large number of electrical devices and labor-savers including range, water heater, sewing machine, vacuum cleaner, flat iron, washing machine, toaster, percolator, fan and electric refrigeration machine. The costs of operating this equipment were figured on the general heating, cooking and combination service schedule which is as follows:

8c per kw-hr. for first 30 kw-hr. per month.
4c per kw-hr. for next 120 kw-hr. per month.
1.5c per kw-hr. for all over 150 kw-hr. per month.

Average installations show that the monthly consumption over a period of a year would be 470 kw-hr. This would give an average monthly bill for the domestic service of $12, or $144 per year. In Table IX it may be noted that, despite the fact that no return is allowed from the farmhouse, the charge for energy used for domestic purposes is included in the total power cost and is considered in figuring the percentage of power cost to gross earnings.

While the model farm of Snook O'Brien was designed as a means of increasing the use of electrical energy by agricultural consumers, it is in reality an argument for the diversification of crops in order that the farmer may secure the greatest benefit from the power which he purchases. The diversification of the crops will not only work toward that end, but also will protect the farmer in case of over-production of any one particular crop or of a failure of any product he might be raising. From the point of view of the central station, any action which may tend to increase the use of electricity and at the same time better the load factor is highly desirable.

Some Achievements and Responsibilities of "Customer-Ownership"

By E. J. Beckett
Assistant Treasurer, Pacific Gas and Electric Company

JUST eleven years ago the Pacific Gas and Electric Company mailed to each of the 260,000 customers then taking service from its lines a circular letter which marked the beginning of a new epoch in public-utility finance. It invited their participation in the purchase of an issue of its first preferred stock, in the following language:

> A number of our consumers have requested the privilege of joining in this subscription, thus obtaining an opportunity of sharing in the profits of the Company and possessing a voice in its management. Believing it to be to the advantage of the Company as well as its consumers that the stock should be distributed to as large an extent as possible among the representative citizens of California who are our consumers, the directors of the Company hereby extend an invitation to all consumers to purchase a portion of the above First Preferred Stock directly from the Company, at the minimum price authorized by the Railroad Commission. This stock may be paid for in full or in installments, in all respects upon the same terms and conditions heretofore offered to the Company's stockholders and employees.

It is, of course, recognized that efforts had been made here and there by industrial corporations and by public utilities to dispose of their stock direct to the public, but it is believed that the Pacific Gas and Electric Company was, without question, the first public utility in the United States to circularize its entire consumers' list and to conduct an organized campaign to sell stock direct to the local public through the efforts of its whole employee organization.

The success attendant upon this innovation in finance and the almost universal adoption by public-service companies throughout the country of what has since been christened the customer-ownership policy, now has become more or less a matter of history as far as the utility industry is concerned, and will not be enlarged upon here except to summarize very briefly some of the results achieved in their relation to the general trend of the distribution of corporate ownership. Suffice it to say, as indicating

the proportions to which this movement has attained nationally, that the electric light and power companies alone in the year 1924 sold by this means 2,478,165 shares of stock and added to their stockholders' lists the names of 294,467 individuals, while in the period from 1914 to 1924, inclusive, 7,525,572 shares were sold direct to 957,367 stockholders.

In the state of California, where the home-ownership idea first was placed in effect and where it probably has had its fullest development to date, a dozen of the largest gas and electric companies were owned at the close of 1924 by 140,637 stockholders, with aggregate holdings of $254.394,000. Of these partners in the utilities dispensing gas and electric service, at least 120,000 reside within the state's boundaries. Assuming each stockholder to represent an average family of four persons, it is a safe estimate that one-tenth of all the families in California have a direct financial interest in these utilities. A list of the companies and the amount of stock held is given herewith. **It is almost startling to learn that the first four companies in this list, at the time of beginning their respective customer-ownership campaigns, had an aggregate of less than 5,500 stockholders, with average holdings of 155 shares each; while their roster of partners now has grown to approximately 122,000, with average holdings of only 17½ shares.** Incidentally, it may be mentioned that the figures here given are exclusive of the common stock of certain of the companies, which are held by holding corporations.

California Power Companies and Customer-Owners

	No. of Stockholders	Par Value of Stock Held
Southern California Edison Co.	70,030	$ 76,097,172
Pacific Gas and Electric Co.	31,859	97,270,300
San Joaquin Light & Power Corp.	11,502	27,139,600
Los Angeles Gas and Electric Corp.	8,482	14,186,300
Great Western Power Co. of California	5,650	7,873,000
San Diego Consolidated Gas & Electric Co.	3,254	6,292,500
Western States Gas and Electric Co.	2,432	4,587,100
California Oregon Power Co.	2,300	8,097,800
Southern California Gas Co.	2,174	7,807,200
Coast Counties Gas & Electric Co.	1,431	3,247,700
Southern Counties Gas Co.	1,258	1,230,000
Coast Valleys Gas & Electric Co.	265	565,700
	140,637	$254,394,372

It is probably no exaggeration to say that the effects of this widespread dissemination of stock, as exemplified above in the distribution of the ownership of California utilities among local investors, have been not only nation-wide in their scope as regards the utility industry itself, but also have been felt in every other branch of industry, and have assisted materially in combating the communistic propaganda which seemed to be gaining such strength in the United States during the post-bellum period as to constitute a serious menace to national progress. Manufacturing and commercial enterprises, and even the railroads, have recognized the significance of the fundamental principles underlying the customer-ownership idea and have made vigorous and successful efforts to obtain a more widespread distribution of their securities than had hitherto been deemed possible.

The following tabulation, extracted from an article by H. T. Warshow, vice-president of the National Lead Company, shows the tremendous strides made toward popularizing corporate ownership in the United States during the past few years. It will be noticed that while, according to his carefully compiled estimates, the total number of stockholders in this country increased from 4,400,000 in 1900 to 7,500,000 in 1913, an addition of 3,100,000 in thirteen years, the next ten years showed a further increase of 6,900,000, bringing the number of partners in corporate enterprises up to 14,400,000. Concurrently, the average number of shares per stockholder decreased from 140.1 in 1900 to 49.7 in 1923. Putting the matter in another way, it may be stated that **in the period from 1913, which comes pretty close to being the opening of the customer-ownership era, to 1923, the total outstanding stock of all corporations in the United States increased less than 10 per cent while the number of stockholders in the country increased 92 per cent.**

Estimated Number of Stockholders, 1900-23

Year	Total Capital Stock of All Corporations in the U. S.	Average No. of $100 Par Value Shares per Stockholder	Estimated No. of Stockholders in the U. S.
1900	$61,831,955,370	140.1	4,400,000
1910	64,053,763,141	86.3	7,400,000
1913	65,038,309,611	87.0	7,500,000
1917	66,584,420,424	77.3	8,600,000
1920	69,205,967,666	57.3	12,000,000
1923	71,479,464,925	49.7	14,400,000

It cannot be assumed, of course, that the market for the distribution of many millions of dollars worth of stock annually to comparatively small investors was always present to the extent that now exists, and only was awaiting the action of the utility companies in initiating the practice of offering their securities direct to the public. Until comparatively recent years, the number of wage-earners who were financially able to invest in stocks was much more limited than at present. Mr. Warshow in this connection cites some interesting figures compiled from the U.S. income tax returns, which show that in the year 1917, 1,399,000 individuals filed returns showing incomes of from $1,000 to $5,000 each, with aggregate net income of $4,181,000,000, or 37.4 per cent of the total income reported by all individuals, while in 1922, 6,193,000 persons were in the $1,000-$5,000 class, with aggregate incomes of $13,522,000,000, or 63.4 per cent of all income reported. It is obvious that the increasing prosperity of what may be termed the wage-earning class to a large degree has influenced their ability to make an investment of any kind. **There can be no shadow of doubt, however, that the customer-ownership movement, as much as any one thing, with the possible exception of the Liberty Loan campaigns, has served to educate the general public in the principles of investment and has promoted the cause of national thrift and of industrial harmony.**

Broad-gauge public utility managers are beginning to recognize that their interest in the prospective purchaser of their securities does not end with merely selling him a stock certificate. Hundreds of thousands of people of moderate means annually are making their very first investment through the purchase of a share or two of stock in their local utili-

ties. A vast number of these investors are more or less inexperienced in financial matters and are unable to analyze accurately the merits of the securities which they purchase. They buy stock in the local electric company largely on the solicitation of the utility's employees of the advice of their neighbors or friends. It is, then, incumbent upon those who have the welfare of the public-utility industry at heart to see that the securities which they sell to their local customers are of an investment rather than a speculative character. More—they should make at least some effort to see that their stockholders are, as far as possible, informed of some of the rudimentary principles of investment to the extent at least of being able to distinguish between stable investments and securities which are highly speculative or worthless. It is an unfortunate fact that thousands of people annually, having once formed the habit of purchasing stocks, become the prey of unscrupulous stock salesmen engaged in selling the securities of all kinds of wild promotions which yield to the salesman a handsome commission, but which mean to the unfortunate purchaser too frequently not only the loss of interest upon his money, but also the loss of the principal itself. Salesmen of this type are particularly active in endeavoring to trade investors out of public-utility securities, which may be readily marketed, substituting worthless issues giving a glowing promise of large profits. An incident, rather exaggerated, possibly, but strikingly emphasizing the misery which may result from this practice, recently came to the writer's attention in the form of a clipping from the San Jose (Calif.) Herald, which is reproduced below:

Stock Transaction Is Suicide Cause

Thought to have been brooding over a stock transaction which had caused an alleged loss of about $2,000, Pat Ryan, aged about 65 years, yesterday took his own life by hanging himself from a transom of his cabin home at 831 Willis Avenue.

Detectives John Guerin and Thos. Short answered the call of Mose Vandermulla, a friend, who found the body, and in turn called Coroner Amos O. Williams, who took charge of the body and will conduct an investigation.

The officers found a note which read: "Please bury me decently. The key is to a safe deposit box at the Garden City Bank. Good Bye, Pat Ryan."

According to Vandermulla, who resides at 731 Martin Avenue, he has known Ryan for a long time and says he leaves a wife and two sons at Sisson, Calif. On December 23, 1924, according to Vandermulla, two men induced Ryan to transfer P. G. & E. stock of the value of $2,000 for stock in another company which Ryan told Vandermulla afterward had proved to be about worthless. Since this transaction Ryan has been brooding over his loss, according to his friend. Vandermulla was with Ryan until a late hour Saturday evening.

Educational work by the utilities through the medium of house organs or bulletins mailed to stockholders can be of material service in placing the inexperienced investor on his guard against unthinkingly exchanging his utility stock for the "securities" (save the mark of unstable, fly-by-night companies at the solicitation of an unknown salesman.

Every effort also should be made to see that stockholders' lists are kept confidential. There are a number of concerns in the country existing and making large profits solely through the sale of these so-called "sucker lists" to promoters and stock salesmen. Hundreds of millions of dollars worth of absolutely worthless securities are sold to the public every year in the United States, to a very large extent to the prospects secured through the use of these lists. In this connection, it is interesting to note that a definite effort is being made in some quarters to stop the compilation and sale of these lists for unethical purposes, as witness the following item in the Wall Street Journal of May 8, 1925:

Ontario Stops "Sucker" Lists

Ontario has passed an order in council prohibiting access to archives of shareholders filed with provincial secretary to all except those having minister's consent. Action has been taken to prevent compilation of 'sucker lists' by stock-selling organizations.

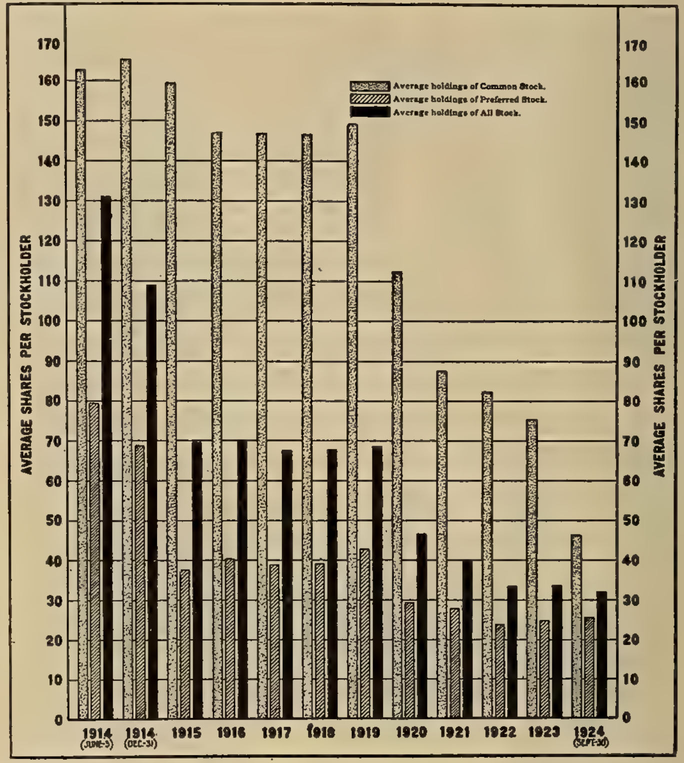


Chart prepared by Pacific Gas and Electric Company showing decreasing average holdings of stock since initiation of customer-ownership plan

Strong efforts also are being made in this country through banking organizations, state corporation commissions, vigilance committees of chambers of commerce and similar bodies, to put an end to the promiscuous peddling of worthless securities, and the public utilities should lend their best efforts to furthering this movement. A great deal of thought and very wide publicity has been given to the advantages of customer-ownership and to the methods by which securities may be sold to the public. The responsibilities of the public-service companies in maintaining the high standard of investments which they offer for sale, and in protecting investors against fraudulent promoters only now are beginning to be realized, and they merit the best attention of the industry.

NEWS OF THE INDUSTRY

Edison Company to Build Third 220-kv. Big Creek Line

Construction of 225 miles of 220-kv. transmission line between the Big Creek-San Joaquin River plants and the Eagle Rock substation of the Southern California Edison Company will be accomplished during the next three years, according to the announced plans of the company. This line, to be known as the Vincent line, will be the third transmission unit of the Big Creek-Los Angeles transmission system. The line and the necessary substation and switching facilities will cost $11,000,000. Additional hydroelectric power to be developed and the present fully loaded condition of the two existing 220-kv. lines are the major reasons for the construction of the new line.

The southern half of the line will follow a right-of-way entirely different from that of the existing lines. This, of course, means that much preliminary work in the nature of road-building and other general preparatory work must be done before construction work on the line itself is started. According to the present plans, road construction will start about Sept. 1. Actual construction work upon the line itself is scheduled to start Jan. 1, 1926, and will take about two years to complete.

Structurally the new line will be similar to the present lines. Due to the fact that much of the line will traverse mountainous country where long spans are possible, the average number of towers per mile as planned will be but 4.2 for the entire length of the line. The conductor to be used has not been announced officially.

Delivery of additional power to the extent of 150,000 kw. will be made possible by the new line. This will bring the total power which may be transmitted from the plants on the Big Creek-San Joaquin project of the Edison company, over the three lines, to 425,000 kw.

Colorado Springs Utility to Be Sold at Auction June 22

Following the presentation of the decree of sale by George S. Munson, counsel for the bondholders' protective committees, and J. L. Bennett, counsel for the co-receivers, Ivor O. Wingren and J. Frank Dostal, the Colorado Springs Light, Heat & Power Company was ordered disposed of at public auction in that city June 22. Judge J. Foster Symes of the federal district court also appointed Mr. Wingren special master to sell the utility. It is expected that the sale and its confirmation by the court will be accomplished in time for the bondholders to turn over the company's electric holdings to the city by July 1. On that date the city plans to commence municipal operation of the electrical distribution system.

The agreement between the city and the bondholders' committees covered the purchase of the company's electrical distribution system within the corporate limits for $600,000 in general obligation bonds (Journal of Electricity, Aug. 15, 1924, p. 142, and Nov. 15, p. 380) and the outside distribution system for $250,000 in income bonds. The city will operate the company's steam plant at Papeton until the municipal steam plant is ready, paying the bondholders for the use of the plant at the rate of 4½ per cent on $600,000.

Irregularities Claimed in Gorge Creek Tunnel Contract

In answer to a suit brought by R. M. Grant & Company, bond house, in the U. S. District Court at San Francisco, to recover $177,425 from R. C. Storrie & Company, principal contractor on the Skagit River development of the city of Seattle, the contracting firm has filed counter charges alleging certain irregularities in connection with the awarding of the Gorge Creek tunnel contract. The bond house seeks to recover the sum of money mentioned claimed to have been advanced to the contractor during the course of construction of the tunnel.

The Storrie company in its denial and countercharge claims that three bond houses doing business in Seattle virtually compelled it to enter into a conspiracy to obtain more than $2,000,000 of utility bonds of the city of Seattle below par, contrary to law and in fraud against the city. It is charged that the three bond houses conspired to obtain the municipal utility bonds at unlawful discount by inducing the contractors to raise their bids sufficiently to absorb the discount, and by promising the contractors certain concessions and rebates. The countercharges also involve C. B. Fitzgerald, former president of the city council, C. F. Uhden, chief engineer for the city on the Skagit project, and have been denied in toto by all firms and persons involved.

In the meantime state examiners have been going over the Skagit books, checking every item of construction, in which the city spent about thirteen million dollars. The Skagit plant was built with the proceeds of ten bond issues amounting to $11,000,000. If it develops that the city has been defrauded, action will be taken by the city council.

Alan C. Van Fleet is attorney for the Grant company and John L. McNab for the Storrie company.

Electrification of Oil Fields Contemplated by Union Oil Company.—The Union Oil Company is considerinig the electrification of its oil fields in the vicinity of Fort Collins, Colo. Should the plan go through, the fields will be served by the Public Service Company of Colorado.

Largest Steel Mill in West to Electrify Rolling Mills

One of the most radical change-overs from steam to electric drive in the history of the steel industry is to be made by the Colorado Fuel & Iron Company at its Minnequa Works, Pueblo, Colo. This plant, the largest steel mill in the West, recently completed arrangements for the adoption of electric power, generated on the premises, for use in its rolling mills.

Complete electrical equipment will be furnished by the General Electric Company. Two 10,000-kw. turbine generators will be the prime movers and will furnish alternating current to the main power lines at 6,600 volts. Other power-house equipment will consist of one 150-kw., turbine-driven exciter and one motor-driven exciter unit. Two 1,000-kw. synchronous motor generators will furnish direct current for operating power house auxiliaries and will tie in with other direct-current mill power circuits. Two 200-kw. dual generators, driven either by steam turbines or by induction motors, will be used to start the station auxiliaries in the event of failure of power from other sources. Three single-phase reactors will limit the short-circuit currents on the auxiliary alternating current bus. A complete switchboard also will be installed in the power house.

Complete electrical equipment will be furnished for driving a rod mill, a 14-in. merchant mill, and a rail mill. Motors with an aggregate capacity of 9,500 hp. will be installed in the rod mill. Two motors will be installed in each of the merchant mills, the 10-in. mill being driven by d.c. motors having a combined capacity of 1,800 hp., while the two d.c. motors in the 14-in. mill will be rated at a total of 2,250 hp. Three a.c. motors witih a combined capacity of 6,200 hp. will drive the rail mill. Direct current for the motors in the two merchant mills will be secured through the use of a 1,680-kva. transformer and a 1,600-kw. synchronous converter located in each mill. Necessary switchboard equipment will be installed in each mill.

A.I.E.E. Elects Officers.—At its annual meeting held in New York on May 15 the American Institute of Electrical Engineers elected the following officers: president—Dr. Michael I. Pupin, professor at Columbia University and well known scientist; vice-presidents—A. G. Pierce, Cleveland; W. E. Mitchell, Birmingham; H. S. Sands, Denver (re-elected); P. M. Downing, San Francisco; W. P. Dobson, Toronto, Canada; managers—M. M. Fowler, Chicago; E. C. Stone, Pittsburgh; H. A. Kidder, New York; treasurer—G. A. Hamilton, Elizabeth, N. J. (re-elected).

Pit River No. 3 to Be Ready for Service Early in July

Construction work on the Pit No. 3 project of the Pacific Gas and Electric Company is progressing smoothly and entirely according to schedule. The diversion dam (and bridge, combined) will be completed in about two weeks at the present rate of progress and will be opened for traffic about three weeks later, according to plans. The tunnel is about 95 per cent complete and is expected to be ready for service shortly. Concrete has been going into the surge chamber for the last four weeks. Nearly 3,500 cu. yd. of material will go into this structure. About two weeks will be required to finish pouring the surge chamber. Penstocks have been erected completely from the power house to the manifold. This manifold will take some additional time for completion due to the rather complicated design and the massive construction. Forms for this manifold are set. No difficulties have been encountered in the pouring operations so far.

Concrete pouring on the roof of the power house building was completed May 25. This was the last of the important jobs of its nature on the project. The 220-kv. bus structure is 100 per cent complete. All oil circuit breakers are in place and ready for service with the exception of a few minor finishing touches. Two of the three banks of transformers are in place and ready for service, and the third will be ready shortly. These banks were dried out, with the transformer cores in the tanks, by means of hot air. A drying unit was made up of a grid heater and a 12-in., direct-connected, motor-operated blower. The whole device was rigged up on the job from equipment available. A core temperature of 75 deg. C was maintained. Each bank was dried out in about a month's time under extremely unfavorable weather conditions.

Power-house interior, switch house, switches and switchboard are about 95 per cent complete and progressing according to pre-arranged schedule. No. 3 generating unit is complete. The armature was expanded, prior to fitting it on the shaft, by means of an electrically heated oven built on the job. Temperatures in different parts of the armature were checked by means of exploring coils installed at different points over the casting. In this way it was possible so to regulate temperatures that undue internal stresses in the casting were avoided. Similar methods served the other units. About 48 hours' time was necessary to accomplish sufficient expansion to permit assembly on the shaft. The second generating unit is about 95 per cent complete and unit No. 1 is about 75 per cent complete. Excavations for the tail race have been finished. Connection to the station bus at one end and to the Pit-Vaca 220-kv. line at the other end is all that remains to put the transmission line into operating condition.

All through this job the different divisions of activities have been so arranged that the maximum amount of work might be carried on with a minimum crew. But slight fluctuations have been noted in the number of men on the job since it was begun.

Construction work on the bus structure was carried on at the same time as that on the structural frame of the power-house building. All excavations for the power house, tail race, penstocks tunnels and lower penstock anchors were made with one full-electric and one steam shovel. Concrete for the power house, bus structure foundations, high-tension switch foundations, penstock tunnels and lower penstock anchors was placed by means of one central, gravity, concrete-placing plant. These features all tended toward speedy and at the same time efficient and economical construction. At the present time there are about 1,350 men engaged in bringing the job to completion.

Utah Towns Consider Whiteway Lighting Systems.—The Lions Club of Payson, Utah, is sponsoring the installation of a whiteway lighting system in the business district of that town. A committee consisting of Lee R. Taylor, Dr. L. D. Pfouts and Reid Persson has been appointed to take the matter up with the city council. The town of Parowan, Utah, also is considering the installation of a whiteway lighting system in the business district. The town of Price, Utah, is publishing notice of intention to construct a whiteway lighting system in the business district.

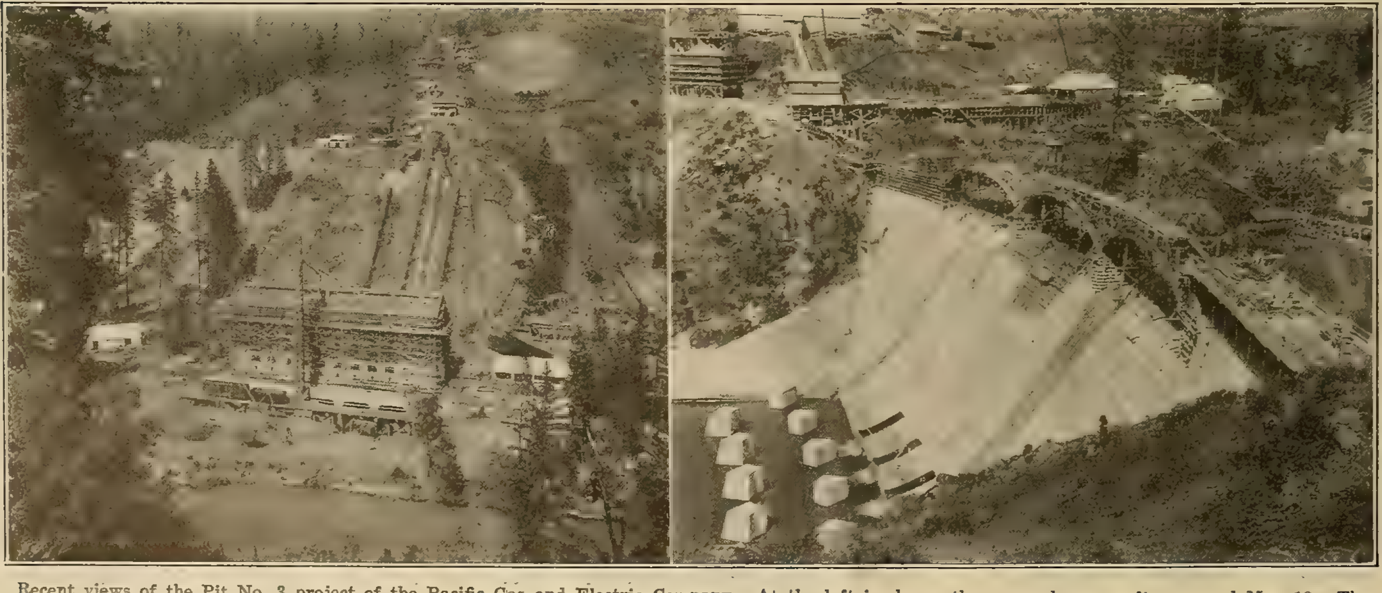
Dealers Display World's Largest Reproductions of Iron

Twenty of the largest irons ever built, exact duplicates of the Hotpoint domestic electric iron, have been built recently by the Edison Electric Appliance Company, Inc., at its Ontario, Calif., works. These irons are being displayed at the present time throughout the United States in Hotpoint dealers' windows. Usually when the irons are being displayed contests are held to determine the weight of the mammoth model.

One of the world's largest irons made at the Ontario works of the Edison Electric Appliance Company, Inc.

The irons are 20½ in. high, 32 in. long at the base. Each iron is fitted with a black ebonized handle, a dark red plug bar, with a thumb-rest of the same color. All of the metal work on the irons is finished in nickel plate, to correspond to the regular product of the company.

Fourth Big Creek No. 1 Unit Is Shipped.—The 25,000-kva., water-wheel generator which will comprise the fourth unit at Big Creek No. 1 power house of the Southern California Edison Company recently was completed and shipped from the Westinghouse factory at East Pittsburgh. This unit is capable of generating 28,000 kva., at 11 kv. and 300 r.p.m. An output of 31,000 kva. at 12.5 kv. may be developed at a speed of 360 r.p.m.



Recent views of the Pit No. 3 project of the Pacific Gas and Electric Company. At the left is shown the power house as it appeared May 18. The diversion dam and roadway bridge is shown at the right as it appeared May 20

Grays Harbor Company Announces Rate Reductions

The Grays Harbor Railway & Light Company, Aberdeen, Wash., has announced a reduction of between 18 and 22 per cent in electric rates to become effective after July 1. The reduction was announced in a letter from E. N. Sanderson of New York, head of the Grays Harbor system, addressed to the Aberdeen city council. The letter also pointed out what Mr. Sanderson considered the pitfalls in the city's plans to develop electric energy on the Wynooche River and suggested that the present city administration abandon the power phase of the Wynooche project.

While the letter discusses only light and cooking rates in Aberdeen, it is understood that the cut will apply throughout the Grays Harbor system and will affect rates in both Hoquiam and Cosmopolis. Although Mr. Sanderson presented a strong plea for protection for his company in the power field in Aberdeen, the cut in prices is in no way conditioned upon any action by the city council, resident officials of the company state.

The reduction in light bills will be important to the average consumer, it is pointed out. Under the new rates, any amount of current up to 200 kw-hr. will be sold at 7 cents, as compared with 9 cents for the first 20 kw-hr., 8 cents for the next 80 kw-hr. and 7 cents for the next 100 kw-hr. under the old rates. A reduction of about 80 cents on the average bill for cooking and heating of $4.40 is expected under the new rate.

Mr. Sanderson declares that the proposed reduction will reduce the company's gross and net earnings by about $42,000, or a reduction of 3 per cent on its investment, leaving 3.4 per cent as the rate of return for the year. The new rates provide a monthly minimum charge of $1.00. The new rate for cooking and heating will be 3 cents per kw-hr.

It was pointed out by city officials that the present administration has no authority to bind the city as to its future power development, and could only express its appreciation of the company's interest in reducing rates.

Denver Men Graduated by Public Utility Speaking School

Fifty Denver public-utility men recently were "graduated" from the "College of Speaking" of the Rocky Mountain Committee on Public Utility Information. Graduation exercises were marked by a dinner given at a local hotel by the members of the committee.

The Rocky Mountain Committee has been conducting a class in public speaking for three years. The attendance in that time has varied from twenty-five to fifty members, one evening of each week. The membership is recruited from every branch of the electric light, telephone, gas and street railway business, also from the ranks of jobbers, dealers and manufacturers. Included among those who regularly attend are managers and department heads as well as men of lower rank. H. H. Argabrite of the Western Electric Company, who has had wide experience in the field of public speaking, is instructor and critic.

Many of those who have been graduated from the information committee's "College of Speaking" took an active part in the franchise campaigns conducted by two of the major Denver utilities, the Public Service Company of Colorado and the Denver Tramway Company. Others regularly make public talks before the various civic, service and luncheon organizations. Others appear regularly before classes in the universities of Colorado and the high schools of Denver.

The committee's college not only has served to perfect the large number of utility men in the art of public speaking, but also it has operated to form a closer bond of friendship and cooperation among the utilities of Denver. The college will be re-opened early next fall.

Puget Sound Company Celebrates Silver Anniversary

The striking growth and development of the central-station business in the Northwest was brought out recently by the Puget Sound Power & Light Company, Seattle, on the occasion of the celebration of its "Silver Anniversary." Grasping the opportunity to tell a romantic and picturesque story of the part played by the company in the upbuilding of the prosperous Puget Sound territory, advertisements and historical sketches were prepared for the newspapers telling of twenty-five years of successful operation under one management.

This publicity material brought out the fact that the Puget Sound Power & Light Company was organized in 1899 to consolidate eight street railroads and three small lighting companies in Seattle, many of which were in the hands of receivers and none of which were able to finance their operations nor meet the demands of the growing city. At that time several small steam plants rendered precarious service each to its own small coterie of customers, mainly for illuminating service; and the chaotic condition of competition among the street railway companies made transportation across the city difficult and expensive.

Contrasting conditions then and now, the advertisements show that by the end of the year the company will operate eleven hydroelectric and eight steam plants with a combined capacity of 248,000 hp., serving over 100,000 customers in 300 communities, by means of 1,185 miles of transmission lines and 4,090 miles of distribution lines. Transportation facilities of the company now include two interurban lines, six street railway systems, and five stage lines, operating over 13,000,000 car miles and carrying 43,271,000 passengers in 1924.

One of the advertisements used by the Puget Sound Power & Light Company to celebrate its "Silver Anniversary"

Appeal Filed by Edison Company in Water Rights Suit

Appeal was filed May 28 with the California state supreme court by the Southern California Edison Company, Los Angeles, to set aside the decision rendered about three months ago in the suit brought against the company by the heirs of the Herminghaus estate (Journal of Electricity, Sept. 15, 1924, p. 220). The judgment barred the company from further impounding water on the head waters of the San Joaquin River for use in conjunction with its Big Creek development project. Water might be diverted into Huntington Lake and thence run through the chain of power houses on Big Creek and the San Joaquin River, under the terms of the decree, but no storage of water would be allowed other than that coming from the runoff in the Huntington Lake basin (Journal of Electricity, March 1, 1925, p. 185.)

The plaintiffs contended that their property, consisting of 17,000 acres of land lying along 22 miles of frontage on the San Joaquin River, would be damaged and their riparian rights interfered with if the company were allowed to impound the river waters and thus prevent the spring flooding of the lands of the estate that provided natural irrigation, deposited silt and replenished the ground water supply.

In the present status of the matter, the decision of the superior court not only prevents the storage in Huntington Lake of San Joaquin River head waters brought through the Florence Lake tunnel, and all additional storage in reservoirs planned at Florence Lake, Vermillion Valley, Shaver Lake and Blaney Meadows on the east side development of the San Joaquin project, but also prevents storage on the entire west side development of the same division of the project. According to the plans of the company, this would comprise eight storage reservoirs and fourteen power houses on the Middle Fork of the San Joaquin River to be constructed upon the completion of the east side development.

S.E.D. Seeks Pictures of Home Application of Electricity

The Society for Electrical Development, Inc., is directing attention to the Spring 1925 Better Homes Supplement recently issued by the American Homes Bureau, Chicago. Nineteen per cent of the space is devoted to electrical service in the home, the material having been supplied by the society. Considerable stress is laid upon lighting, so that the edition constitutes a follow-through on the Home Lighting Contest, in addition to stimulating the buying of all kinds of electrical appliances.

The supplement is syndicated and publication rights already have been sold to newspapers in about 100 cities. Similar supplements are issued each spring and fall. Material used in the spring issue constitutes the fourth contribution of the Society for Electrical Development. It is planning to supply copy for the forthcoming fall supplement, but it needs photographs which show the application of and sell the idea of electrical service in the home. This type of photograph, rather than that exploiting a particular make of product, will be utilized in making line drawings. The society suggests that photographs of this nature be sent to the News Service Department, The Society for Electrical Development, Inc., 522 Fifth Avenue, New York.

Great Western Power's S. F. Division in New Offices

The San Francisco division of the Great Western Power Company recently moved from 347 Grant Avenue, where it had been situated for many years, to new quarters at 437 Sutter Street. The building, which was purchased by the company, has been remodeled completely. Rapid growth of the company's business in San Francisco necessitated larger offices, according to officials of the company, and improved service will be one of the results of the move.

One of the features of the new quarters is the modern electric kitchen in charge of a demonstrator, who will give information on the various uses of electricity in the home. The company also has on display a complete line of electric ranges, air heaters and water heaters.

Pacific Coast Number Issued by Western Electric Dealer

The May issue of The Western Electric Dealer, which is published monthly in the interest of its dealers by the Western Electric Company, Inc., is a special Pacific Coast number. From its attractive cover, which uses each letter of the magazine's name to acclaim in illustrated form many of the outstanding attributes of that region of the country, to the back cover, which heralds the N.E.L.A. convention with the heading, "New Light from the Golden Gate," the issue is devoted to the states of Washington, Oregon and California.

The leading article, by J. U. Berry, advertising manager, and C. F. Wolf, illuminating engineer, of the Valley Electrical Supply Company, Fresno, deals with the merchandising methods of that concern and also discusses the solving of the illumination problem through the use of proper fixtures. There are, in addition, numerous shorter articles about various dealers in different parts of the Pacific Coast territory. Many excellent photographs portray window displays, store interiors and exteriors, electric signs and kindred subjects. Two pages are given over to photographs of the radio broadcasting station KFI of Earle C. Anthony, Inc., Los Angeles. All in all, the May Western Electric Dealer is a particularly interesting and attractive issue.

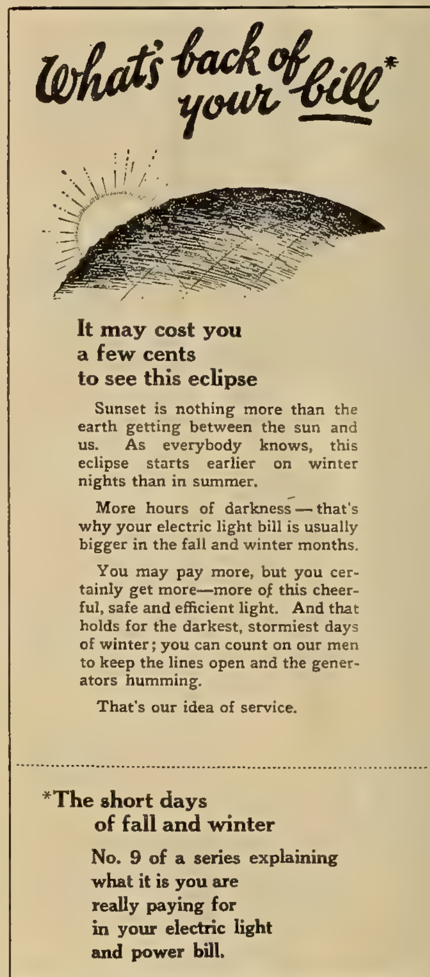
House Organ to Be Published by Denver Central Station

The Public Service Company of Colorado, for the first time since its consolidation of subsidiary companies, is publishing an employees' magazine, "The Triad," the first issue of which has just been distributed.

In keeping with the practice of other Doherty companies, each of the independent companies is publishing a magazine, monthly or oftener, devoted to the interests of the public and stockholders as well as the employees. The magazine is published twice a month under the direction of F. R. Jamison as editor, with E. K. Hartzell and R. A. Turner as associate editors, the latter devoting all of his time to the publication.

Messages for Backs of Monthly Bills Are Prepared

Designed to present to central-station customers an idea of the service that is being rendered in return for the monthly bills, the Western Electric Company, Inc., has prepared a series of messages entitled, "What's Back of Your Bill?" The company has prepared twelve of these messages which can be printed upon the backs of any central-station company's monthly bills, and to assist company managers in their use has bound the series in pamphlet form.



One of the messages prepared by the Western Electric Company for use on the backs of customers' monthly electrical bills

Each one of the pieces of copy is illustrated, the drawing tying in closely with the printed message. The Western Electric Company has offered to furnish the illustrations, free of charge to any central station desiring to use them. Complete information concerning the series may be secured from the company's head offices, 100 East 42nd Street, New York City.

City of Eugene, Ore., Files on Power Site.—Application has been received in the office of Rhea Luper, state engineer, Salem, Ore., for the appropriation of water from the McKenzie River for power development and municipal water supply by the city of Eugene. The application calls for 10,795 theoretical horsepower at the dam site in Lane County, and 17,454 theoretical horsepower at the end of the canal. The cost of the development is placed at $375,000 in the application.

Muscle Shoals Power May Not Be Sold During Test Period

Washington Correspondence

Apparently power at Muscle Shoals will be available so sporadically during the testing period, which will extend from August to late next spring, that no formal contract will be entered into for such power as may be available for sale.

The electric contractors in charge of the installation which will convey the power away from the dam have advised the chief of engineers that the testing of machinery should be conducted under load and not with water rheostats as had been suggested. They also point out that a temporary installation will advance greatly the tuning up of the plant and can be handled in such a way as to create no additional hazard. In this way it will be possible, it is believed, to test out the four generators which are being installed first.

It may require until Dec. 1, or even the first of the year, General Taylor says, to complete the testing of the four generators. It is expected that the switchboard then will be ready for test, after which the four other generators are expected to be ready for testing.

General Taylor believes it would interfere unduly with the completion of the project to be under any commitments or even under implied obligations to give advance notice as to the cutting off of power. He favors an arrangement whereby the tests can be made under the actual load that would be furnished through connection with the lines of the Alabama Power Company. That plan, however, will reduce the return to the government for the sale of the temporary power. With no assurance as to continuity of power it would be necessary for the Southeastern power companies to keep their steam auxiliaries ready for immediate use. Under such conditions these companies probably would be willing to pay for this power nothing more than such saving of coal as would result.

Illuminate San Diego Pool with Underwater Floodlights

Notable in many respects for its electrical installations, perhaps the most unique feature from an electrical standpoint, in the million-dollar amusement center at Mission Beach, San Diego, is the installation of underwater illumination in the giant bathing pool constructed there and formally opened May 29.

A set of seven large floodlights is embedded in the walls of the pool at its greatest depth of 9 ft. The lighting units are enclosed in a large pyramid-shaped casting, having a vent at the top leading through a goose neck to a manhole back of the pool walls. The lamp unit is protected from the water by a 7/16-in. Pyrex glass, 18¾-in. in diameter. Difficulties as to the cracking of heavy plate glass had been numerous until the adoption of the heat-resisting glass. Water on one side of the glass at low temperature and the heat generated by the 500-c.p. lamp in the unit on the other side of the glass, together with moisture, condensation, and other mechanical factors, have provided considerable basis for experimentation on this installation.

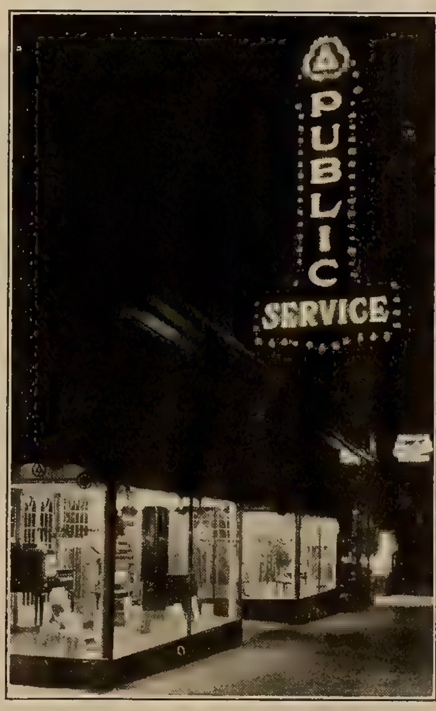
Other electrical features of the amusement center aside from the Luna Park now under construction, are numerous. The big pool and the children's pool are being lighted by a large number of overhead lights, focused by large enameled reflectors. In the corridors and balconies beautifully designed and ornamented lighting fixtures soften and harmonize the illumination with the artistically decorated building itself.

Outside, big floodlights illuminate the building, and two giant searchlights and a number of floodlights make the long beach a blaze of light at night, permitting night surf bathing.

Electric conveniences abound in the general operation of the bath house, from its elevators to carry wet suits to an electric laundry, to its extensive telephone and fire alarm systems, its fire protection apparatus and its controls.

An extensive street and esplanade lighting system has been installed, utilizing the Westinghouse equipment of standard street lighting. An elaborate system of light controls and dimmers has been installed in the dance pavilion. Microphone connections with long-distance lines are contemplated to broadcast the dance music through a Los Angeles radio station.

Power Generation Suggested in California Water Resources Report.—In a report on the water resources of California filed with the 1925 legislature, it is stated that with 400-ft. dams on the upper Sacramento, the Feather and Yuba Rivers, and a 300-ft. dam on the American River, 3,000,000,000 kw-hr. of electrical energy could be generated annually prior to the full use of these reservoirs for domestic, irrigation or industrial use. In the main the report deals with the importation of water for irrigation in certain sections of the interior valleys where the supply of ground water is nearing exhaustion.



New electric sign of the Public Service Company of Colorado at its Boulder, Colo., office. The sign proved an effective advertisement in a commercial lighting campaign being conducted by the new business department of the company. Following the installation two sales were made in Boulder

Reservations Now Being Made for Electragists' Annual Meeting

Plans are progressing rapidly for the 1925 annual convention of the Northern Division of the California Electragists to be held in Eureka Aug. 6-8. Hotel reservations must be made through the San Francisco office of the California Electragists, 522 Call Building, and it is suggested this be done at once. Those planning to attend are requested to give complete information when writing regarding the accommodations desired. The convention registration fee will be $5 per person as in the past.

A committee of six has been appointed by Victor Lemoge, president of the organization, to take complete charge of all details of the convention, and the committeemen promise a most interesting and valuable program. The program of entertainment is being prepared by the Eureka electragists, and they are sure to have something that will be interesting to every member of the family. The convention is open to anyone in the electrical industry, and from the preliminary reports a large number is planning to be present. More detailed information covering the convention plans will be sent to all electragists in the near future; they will also appear in the July 1 issue of the Journal of Electricity.

Colorado Investigation Bonds Voted by Los Angeles

Los Angeles voters at an election on June 2 approved the sale of $2,000,000 worth of bonds, the proceeds of which are to be used to make a complete and adequate survey of the possibilities of bringing water from the Colorado River to Los Angeles for domestic purposes. The final count stood 86,149 for, and 15,909 against, the bonds.

In urging the vote for this bond issue great stress was laid upon the imperative need of a plentiful supply of water for the city in its future growth. However, the advocates of municipal water and power in Los Angeles gave it their unqualified indorsement and it is looked upon as a forerunner of their attempt to enter actively into the power development of the Colorado River.

Third Annual Radio Exhibition in Los Angeles Sept. 5-12

Announcement has been made that the third annual National Radio Exhibition will be held at the Ambassador Auditorium, Ambassador Hotel grounds, Los Angeles, Sept. 5-12, inclusive.

This exhibition will be conducted by the Radio Trade Association of southern California, consisting of the Radio Dealers' Association, Radio Jobbers' Association and the Radio Manufacturers' Association. The program calls for daily spectacular entertainment and illustrated educational lectures where nationally known radio experts and authors will be featured.

A special preview of the Radio Exhibition for dealers and the trade only will be held the evening of Sept. 4. This will enable exhibitors to make contact with the trade when the general public is not invited.

Thousands of radio dealers and "fans" who are not able to attend will be reached through the broadcasting of programs.

Dealer Home Lighting Campaign Planned by Westinghouse

A home lighting campaign, planned to enable electrical dealers to take advantage of the interest aroused by the recent national better home lighting contest, has been prepared by the Westinghouse Lamp Company in cooperation with the merchandising section of the Westinghouse Electric & Manufacturing Company.

The material to be used in the campaign has been prepared with a view toward making it as far as possible an individual dealer campaign. The printed matter will be published in the name of the dealer, with very little reference to the Westinghouse company and will be written in the second person. It is believed that a much more personal appeal thus will be made than would be the case with ordinary circular letters and booklets.

This campaign material will consist of a personal letter on an attractively lithographed letterhead to be sent to each customer and prospect, together with a copy of "The House That Jack Rebuilt." This is a 20-page booklet describing the transformation of a home through the application of proper lighting. It is written in conversational style and is illustrated with full-page pictures in five colors showing proper lighting arrangement in different rooms. There are numerous small illustrations of lighting fixtures and appliances. The last two pages of the book written in the first person, are devoted to explaining that the local electrical dealer is especially fitted by his training and experience to arrange lighting fixtures not only to add to their efficiency but to furnish esthetic atmosphere and extending a cordial invitation to consult with him.

With this booklet is sent a return postcard imprinted with the dealer's name and address. To all prospects who send back the return postcard a second letter is sent, together with "The Vogue in Home Lighting," a 48-page booklet, fully illustrated with photographs and diagrams. This booklet is a textbook on modern home lighting and contains suggestions to home-owners as to how they may improve the illumination in their houses, with the help of the dealer.

Employees' Manual Contest Closed by Washington Utility

The employee's viewpoint of public relations work is clearly shown in an article prepared by F. J. Rotter, a draftsman in the engineering department, The Washington Water Power Company, Spokane. The article was awarded the first prize of $50 in a contest within the company for the best presentation of the subject to be used as the concluding chapter of the employees' manual distributed by the utility. The second prize of $25 was won by T. E. Holsey, division agent at Okanogan, Wash., while honorable mention was given to E. H. Collins, engineering department, H. P. Venables, commercial department, and J. G. Finley, service department.

The winning article, which is to be printed as Chapter 12 of the manual, is entitled "Building Good Will," and it summarizes some of the facts contained in the manual and touches the high spots in the preceding chapters. The following extract from it indicates its merit:

"More money is paid out for the labor of men and women than for anything else in the world. Labor, therefore, is the greatest of all commodities. The true worth of work is not a matter of either hours or the task. Rather, it is the quality of service rendered that sets the value. If the daily performance of every utility employee squares with these principles, if courtesy, honesty, loyalty and devotion are enlisted in the campaign for better and broader public relations, employees will make friends for their company and the suspicions of propaganda will be cast into discard by enlightened public opinion."

Japanese Utility Plans Extensive Power Development Project.—Permission to appropriate water from the Tenryu River for generation of electric energy has been granted the Tenryugawa Power Company of Japan. The company plans to develop five sites with an aggregate plant capacity of 100,500 hp., according to advices from Japan.

Manufacturer Prepares Displays for Central Stations

A portable window display, a sample of the "DeLuxe Window Service" being offered to central stations by Manning Bowman & Company, has been placed on exhibition in the Pacific Coast district offices of the company at 150 Post Street, San Francisco. The display presents one of the seven that have been prepared by the advertising department of the manufacturer.

The portable exhibit, in addition to presenting an attractive display of electric percolators, demonstrates the most modern practice in color-lighting for show windows. The service being offered by the company has been taken up by a number of Western central stations. A complete description of the service will be presented in the Better Merchandising section of the Journal of Electricity at an early date.

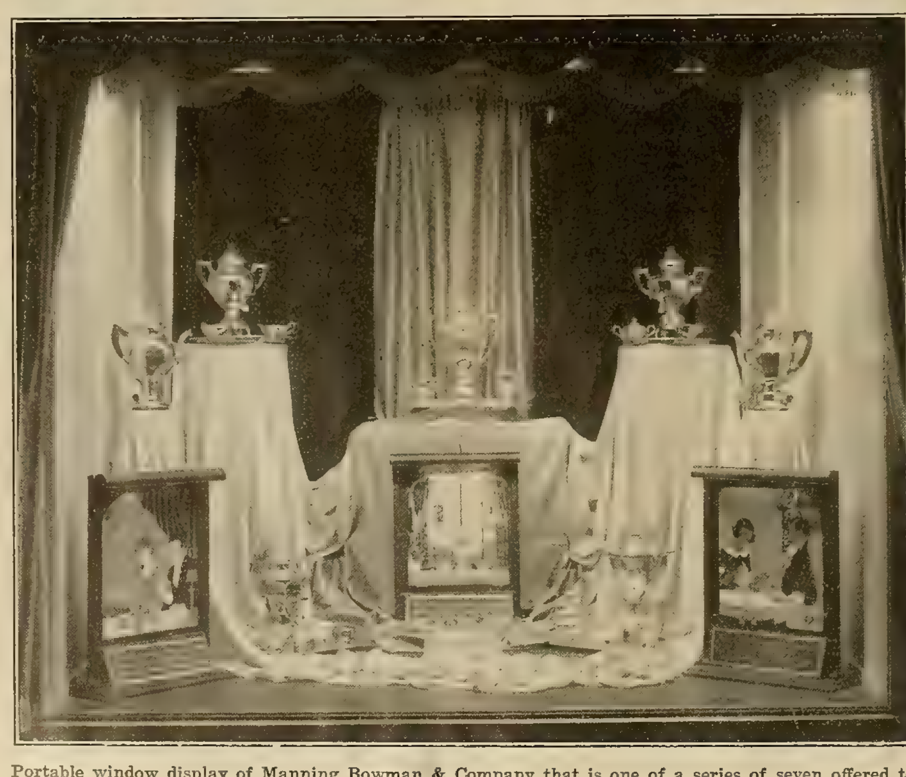
Irrigation Districts and Utility Join in Power Project

Under the cooperative agreement with the Oakdale and South San Joaquin Irrigation Districts, the Pacific Gas and Electric Company will build a 30,000-kw. hydroelectric plant to cost $1,500,000 on the Stanislaus River near Melones, Calif. On May 18 the two irrigation districts approved a bond issue of $2,200,000 for building a dam and reservoir. The power company will build the power plant. In return the Pacific Gas and Electric Company will pay for the water an amount aggregating $5,175,000 over a 40-year period, or approximately $125,000 a year, an amount sufficient to meet all interest and retirement payments on the bond issue of $2,200,000.

After the power company has made the payments stipulated it will bear half the expense of maintaining the storage facilities. A 210-ft. dam of 112,000 acre-ft. capacity is to be built across the Stanislaus River near the town of Melones in central California. The power house a mile down the river will connect with the dam by a tunnel, so built as to take the greatest possible advantage of the head available. The dam is to be built immediately, but the date for completion of the power plant has not been set.

Denver Has Third Electrical Home Exhibit

More than 10,000 people have visited the third electrical home in Denver since it was opened to the public May 24. Many favorable expressions are being received by the Electrical Cooperative League in connection with the exhibition, according to reports from Denver, because of the completeness of the home and the presence of many features not found in previous exhibitions of a similar nature in the Inter-mountain territory.



Portable window display of Manning Bowman & Company that is one of a series of seven offered to central stations

Meetings

Quarterly Meeting of Southern Electragists June 27

The first quarterly meeting of the California Electragists, southern division, will be held at the Hotel Maryland, San Diego, Saturday, June 27, 1925. The members of the southern section and their friends will leave Los Angeles harbor on the S.S. Ruth Alexander, Friday, June 26, at 6:30 p.m. A dinner dance, together with other entertainment, will be a feature of the evening.

The ladies will be entertained during the morning. A golf tournament is planned, as well as automobile trips to the Mission Hills, Ramona's Marriage Place, Point Loma, and the old Spanish lighthouse. At the same time the men will convene to discuss the question of electrical merchandising, under the chairmanship of O. N. Robertson of Santa Ana. At noon the party will adjourn to attend the first annual baseball game between the jobbers and manufacturers, and the electragists.

In the afternoon the ladies will be taken through Balboa Park to enjoy a recital on the outdoor organ, while the men will continue their session of the convention to discuss the outline of the electragists' program for the future and the Red Seal campaign. H. H. Harper of the Western Electric Company and F. M. Feiker of The Society for Electrical Development will be the principal speakers.

The San Diego electragists and their friends will entertain the guests at the evening banquet, and at 10 p.m. the party will re-embark on the Ruth Alexander for the return trip to Los Angeles. The entire expense for the trip will be $13 per person. Reservations may be made through C. J. Geisbush, Room 610 Cotton Exchange Building, Los Angeles.

California Electrical Bureau Organization Changed

After a prolonged and intimate discussion, the plan for reorganization of the California Electrical Bureau as submitted by the finance committee was adopted by the Advisory Board at a meeting held in Los Angeles May 29. This plan is far-reaching in its nature and provides that beginning June 1 the Bureau will maintain offices in San Francisco and Los Angeles, the former in charge of Victor W. Hartley as executive secretary, the latter in charge of W. F. Brainerd. G. M. Rankin will continue as field man, performing special duties in the San Joaquin Valley district with headquarters at Fresno.

An arrangement has been perfected between the Bureau and California Electragists by which through the establishment of a basis of cooperation Electragists will undertake the responsibility for handling the greater part of the field work for the Bureau in carrying out such sales-promotion plans as may be developed from time to time. The Electragists also will assist the Bureau in bringing about the organization of a merchandising section within the Bureau and the establishment of local branches of this section at such points within the state as may be advisable. It was pointed out during the discussions that this arrangement undoubtedly would be far-reaching in its effect upon the electrical industry in California, and offers for the first time a practical means of bringing about the most complete cooperation between all branches of the industry in increasing electrification in the state.

The recommendations of the Society for Electrical Development with respect to details concerning the operation of the Red Seal Plan were approved by the Advisory Board, thus settling the last matter of detail in these negotiations so that active work may be prosecuted in this effort as soon as the N.E.L.A. convention is over. Two subcommittees have been appointed by the Advisory Board for the purpose of exploiting the Red Seal idea within the industry. These committees consist of H. L. Harper, chairman; W. L. Frost and F. E. Elser in southern California, and W. S. Berry, chairman; C. E. Heise, and C. L. Chamblin in northern California.

The secretary reported with respect to the electric home program that three homes already had been completed showing a total attendance of 16,600, and nine other homes are under way to be completed and exhibited during the course of the year. On the June Bride Week campaign 150 sets of window-display material already are being displayed throughout the trade, while 5,000 posters and 292,000 direct-mail inserts were distributed by power companies, jobbers and electrical retailers. A window-lighting exhibit has been displayed before thirty-four meetings with a total attendance of 2,591, resulting in twenty-six immediate sales and sixty-six live prospects directly traceable to the interest displayed in this exhibit. At the recommendation of the Pacific Radio Trade Association the Bureau will include radio outlets in the Bureau's wiring plan when a new edition is issued.

COMING EVENTS

Pacific Coast Electrical Association—
Annual Meeting—San Francisco, Calif.
June 15, 1925

National Electric Light Association—
Annual Convention—San Francisco, Calif.
June 15-19, 1925

Utah Engineering Council Hears President of A.I.E.E.

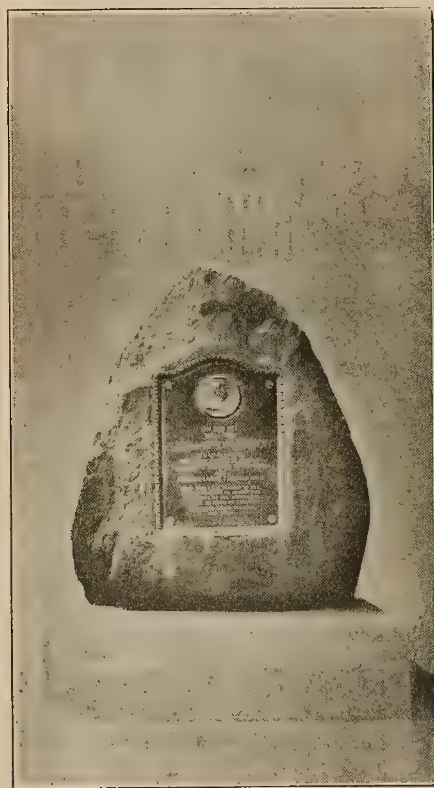
Farley Osgood, president of the American Institute of Electrical Engineers, was the principal speaker at the annual banquet of the Engineering Council of Utah, held at the Hotel Utah in Salt Lake City on the evening of May 23. About two hundred guests were present.

Mr. Osgood stressed the fact that engineers should take a greater part in the political life of the country. He said that those of this profession, by reason of the training that they had received, were highly qualified to assist in directing the affairs of the municipalities, the states and the nation. That they do not occupy such positions, the speaker declared, is because of their own apathy. "There should be an engineer on every committee having to do with public problems, for a great majority of these problems are engineering problems," he declared.

G. M. Bacon, state engineer of Utah, and president of the Engineering Council of Utah, was also one of the speakers. Markham Cheever, chief engineer of the Utah Power & Light Company, was toastmaster.

Bronze Tablet Erected in Honor of Thomas A. Edison

In the presence of the entire Edison family, the governor of New Jersey, the mayors of a number of New Jersey and New York cities, the president of Princeton University, the chief executives of the larger companies in the electrical industry, and practically all the surviving early associates of the great electrical genius, Mrs. Thomas Alva Edison on May 16 unveiled a beautiful bronze commemorative tablet marking the spot in Menlo Park, N. J., where Edison began his experiments and where nearly all his inventions were conceived and perfected.



Bronze tablet erected by the Edison Pioneers in honor of Thomas A. Edison

The tablet, set in a huge natural boulder which rests on a base of concrete containing bricks from the foundation of Edison's first home in Menlo Park, is erected on the Lincoln Highway within a stone's throw of the site of the original Edison laboratories and workshops and of the present Edison home. It bears the following inscription:

> On this site—1876-1882—Thomas Alva Edison began his work of service for the world to illumine the path of progress and lighten labor for mankind. This tablet is placed by the Edison Pioneers to attest the gratitude of the industries he did so much to create.

As a state monument, the tablet formally was given into the custody of Governor George S. Silzer of New Jersey by John W. Lieb, vice-president of The New York Edison Company and first electrician of the original power-generating station built by Mr. Edison in New York City in 1882. Mr. Lieb presided over the day's ceremonies.

Personals

J. E. Macdonald, secretary of the Joint Pole Committee of Los Angeles, recently was elected president of The Electric Club of that city. Since 1907, when the joint users of electric light, telephone and telegraph poles in Los Angeles formed the Joint Pole Committee, he has been secretary of that body. Mr. Macdonald was born in Canada and graduated from McGill University, Montreal, in 1897, receiving degrees in both electrical and mechanical engineering. Upon leaving college he became an apprentice draftsman at the Browne & Sharp Manufacturing Company's plant at Providence, R. I., and then entered the employ of the William Sellers Company of Philadelphia, where he was employed as a designer of electrical traveling cranes. He arrived in California in 1901. For the first three days he wheeled bricks, according to his own statement, after which he joined the Pacific Electric Railway as line superintendent, leaving that organization in 1907 to assume his present position. Mr. Macdonald organized the Los Angeles Section of the American Institute of Electrical Engineers in 1908, was secretary for three years, and then served a term as chairman. At the present time he is vice-president of the A.I.E.E.

J. E. MACDONALD

D. J. Jackson, until recently sales manager of the Dudlo Manufacturing Company, Fort Wayne, Ind., has joined the organization of the Lombard J. Smith Company, the Dudlo company's representative in southern California and Arizona.

R. B. Childs, of the sales department of The Washington Water Power Company, Spokane, visited Seattle lately on company business.

T. P. Walker, manager of the El Paso Electric Railway Company, El Paso, recently returned from Houston where he attended the annual convention of the Southwestern Public Service Association.

Col. William Kelly, chief engineer of the Federal Power Commission, shortly will become director of engineering for the National Electric Light Association. **Maj. G. E. Edgerton,** assistant chief engineer, will succeed him.

R. E. Kinkead, former chief engineer of the welder division of the Lincoln Electric Company, Cleveland, has been transferred to the sales department as director of sales with headquarters in the Ellicott Square Building, Buffalo.

J. L. Beebe, formerly with the Western Electric Company, Salt Lake City, now is representing the Trumbull Electric Manufacturing Company. Mr. Beebe will cover the Pacific Northwest, with headquarters at 2511 East Cherry Street, Seattle.

R. F. Walter has been officially appointed chief engineer of the Bureau of Reclamation, succeeding F. E. Weymouth who resigned last fall. Mr. Walter has been acting chief engineer since that time.

H. F. Hartzell, vice-president and general manager, Maydwell & Hartzell, Inc., San Francisco and Los Angeles, recently left San Francisco on a trip to the East via Seattle and Spokane with the intention of visiting all of his company's factories and connections.

R. G. Chamberlain, district manager, The Hurley Machine Company, Seattle, visited Spokane recently on general sales matters.

M. A. DeLew, electrical engineer, Associated Oil Company, with headquarters in Los Angeles, was a recent San Francisco visitor.

Z. E. Merrill, assistant general manager, the Mountain States Power Company, Albany, Ore., visited Spokane recently on his return from an inspection trip of the properties at Casper, Wyo.

R. W. Turnbull, Pacific Coast sales manager, Edison Electric Appliance Company, Portland, recently spent several days in Spokane in order to cooperate with the sales department of The Washington Water Power Company in the campaign on Hotpoint electric ranges which the latter has been conducting. **R. W. Cordiner,** special representative of the Edison Electric Appliance Company, also spent some time in Spokane giving his assistance in the same campaign.

C. E. Lasher, Tacoma, Wash., has been transferred to Everett to assume charge of the Puget Sound Gas Company. He succeeds Jesse Bourus, who has accepted an executive position with the Mountain States Power Company, the parent organizaiton.

F. B. Schuyler, president of the Johnson Washer Company of Oakland, recently has returned from the Pacific Northwest and the Intermountain territory, where he visited the company's distributors and investigated business conditions.

Lewis A. Lewis, sales manager of The Washington Water Power Company, Spokane, accompanied by **R. B. Childs** of the commercial department, lately made an inspection trip of customers' properties and service facilities in the Coeur d'Alene mining dstrict of northern Idaho.

M. P. Maxwell, sales manager of R. Thomas & Sons Company, New York, visited Spokane recently in the course of a general sales trip to the Coast.

F. A. Short, Safety Electric Products Company; **J. H. Pengilly,** Brown & Pengilly; and **Rollin M. Smith,** Rollin M. Smith Engineering Company, all of Los Angeles, were among those who attended the recent public hearing in San Francisco an the tentative Electrical Safety Orders issued by the Industrial Accident Commission.

G. A. Muir, who has been connected with the Denver office of the Allis-Chalmers Manufacturing Company for the past five years and for ten years previous to that with the machinery department of the Mine & Smelter Supply Company, Denver, has been elected president and manager of The Advance Machinery & Supply Company of that city.

C. P. Shattuck, until recently technical editor of the Commercial Car Journal, has joined the staff of The Society for Electrical Development, New York City. He will be connected with the electric delivery truck department.

H. R. Knelson has been appointed sales engineer of the Everstick Anchor Company for the territory west of the Mississippi. He recently was connected with the construction department of the Illinois Bell Telephone Company.

W. A. Hillebrand, from 1919 district engineer, Pacific Coast division, The Ohio Brass Company, Mansfield, Ohio, has been transferred to Barberton, Ohio, where he will assume the position of electrical engineer for the Ohio Insulator Company, which is the clay department of the Ohio Brass Company. After graduating from Cornell University in 1905, Mr. Hillebrand spent a year at Stanford University as a graduate student, after which he spent a year in the Western Electric Company's organization both in San Francisco and Los Angeles. From 1907 to 1911 he was instructor and assistant professor of electrical engineering at Stanford University, and then for the succeeding three years held the post of professor of electrical engineering at Oregon Agricultural College. In 1914 he entered the distribution department of the Pacific Gas and Electric Company, San Francisco, remaining until 1918 when he joined the Federal Telegrah Company at Palo Alto. He left the Federal company to become associated with the Ohio Brass Company. Due to the interest now being taken in the East in high-tension transmission lines, the number of such lines has been increasing steadily and the progress being made rapidly is lessening the lead which California heretofore has maintained. On account of this active interest Mr. Hillebrand's knowledge and experience will be particularly valuable in his new position with the Ohio Insulator Company where his time will be devoted largely to factory and commercial problems. Mr. Hillebrand is a member of the American Institute of Electrical Engineers.

W. A. HILLEBRAND

R. H. Ballard, vice-president and general manager, Southern California Edison Company, Los Angeles, recently left California for an extended trip through Europe.

H. W. Stitt, city electrician of Fresno, Calif., attended the public hearing on the proposed Electrical Safety Orders recently held in San Francisco.

E. M. McLean, former sales division manager of the Four Wheel Drive Auto Company, Clintonville, Wis., has been promoted to general sales manager of that company.

R. L. Hearn, assistant chief engineer of The Washington Water Power Company, Spokane, has tendered his resignation and left for Niagara Falls, Ontario, where he will enter into partnership with H. G. Acres, who has been engaged in consulting work in hydraulic engineering with especial attention to hydroelectric developments. Mr. Hearn spent several years with the Hydro-Electric Power Commission of Ontario, where he served under Mr. Acres, who was formerly chief engineer for the commission. During the Queenstown development on the Niagara River Mr. Hearn was chief draftsman, and during the last year of his connection with the commission he supervised the actual construction. In June, 1922, he entered the service of The Washington Water Power Company at Spokane as hydraulic engineer and soon afterwards was appointed assistant chief engineer. In that capacity he supervised the latter portion of the construction program in the Spokane Upper Falls development. Since then and under the direction of V. H. Greisser, chief engineer, Mr. Hearn has supervised the design and construction of the rolling sector gate installed at the Post Falls development, and all the preliminary surveys, exploration work and designs for the development at Kettle Falls, Wash., on the Columbia River, the construction of which has

R. L. HEARN

been deferred. He also supervised the installation of the fourth 23,500-hp. unit at Long Lake power station, and the installation of the second 2,150-hp. unit at Oroville power station. During his residence in Spokane he was active in committee work for the National Electric Light Association and the Northwest Electric Light and Power Association. During the past year he has been chairman of the hydraulic power committee of the latter body. He is a graduate of the University of Toronto, and a member of the University Club and the Spokane Transportation Club.

T. M. Simpson, until recently vice-president and general manager of the Majestic Appliance Company, San Francisco, has been appointed manager of the electric advertising department of the Great Western Power Company of California, with offices at 530 Bush Street, that city. Mr. Simpson is well known to the members of the electrical industry, having been identified with the business for many years, both in the East and on the Pacific Coast. From 1903 to 1907 he maintained engineering offices in New York and Philadelphia, designing and contracting for the installation of power plants. Subsequently he was identified with the Hallidie Machinery Company, Spokane, Wash.

C. W. Scholefield, Standard Oil Company, Bakersfield, Calif, was a recent visitor in San Francisco where he attended the public hearing on the tentative Electrical Safety Orders.

S. C. Haver, Jr., supervisor of employment, Southern California Edison Company, Los Angeles, will add to his other duties that of chairman of the company's accident prevention committee, succeeding the late J. A. Lighthipe. The other members of the committee are: **T. H. Dukelow, R. E. Cunningham** and **A. F. Blight.**

C. M. Clark, Philadelphia, chairman of the executive committee of the board of directors of the Portland Electric Power Company, Portland, spent a few days in Portland recently looking over the properties of the company and conferring with officials as to future activities.

P. A. Anderson, formerly industrial engineer of the Great Western Power Company, Oakland, has joined the staff of the Oakland Bank as manager of their new business department.

Henrik Moe, president of the Moe-Bridges Company, Milwaukee, recently toured the Pacific Coast cities, accompanied by **B. J. Wildman**, Pacific Coast manager of the concern.

E. C. Gribble, president, the Electrical Specialty Company, San Francisco, recently left for a six-weeks trip East. While there he will visit the various factories which the Electrical Specialty Company represents on the Pacific Coast.

C. A. Bloom, advertising manager, Appleton Electric Company, Chicago, was a recent visitor on the Pacific Coast, where he made a study of conditions regarding distribution problems.

H. B. May, formerly of the Los Angeles office of the General Electric Company, has been transferred to the San Diego office in the capacity of resident agent for that locality.

Hal E. Cowgill, former operator of the high-tension substation of the Southern Pacific Company at Forest Grove, Ore., is now distributor for the Commercial Truck Company, builders of electric trucks, with offices at 202 Oregon Building, Portland. **Claude Jones** succeeds Mr. Cowgill at Forest Grove.

H. F. Dicke, for the past eight years general manager of the Utah Light & Traction Company, Salt Lake City, recently became assistant to the president of the Lehigh Valley Transit Company, operating between Allentown, Pa., and South Bethlehem, vice-president of the East Penn Electric Company of Pottsville, Pa., and vice-president of the Williamsport Passenger Railway Company of Williamsport, Pa. Mr. Dicke's headquarters will be at Allentown. Mr. Dicke is a native of Fort Wayne, Ind. In 1899 he entered the accounting department of the Fort Wayne Traction Company, where he served for a period of five years, resigning to become general auditor of the Ohio & Indiana Construction Company. For seven years he had charge of operation of the northern division of the Ohio Electric Railway Company, and then resigned to go to Boise, Idaho, as general manager of the Boise Valley Traction Company. Five years later he became general manager

H. F. DICKE

of the Utah Light & Traction Company at Salt Lake City. Mr. Dicke will be succeeded by **E. A. West**, for the past nine years general superintendent and chief engineer of the Denver Tramway Company, with headquarters at Denver.

Obituary

B. S. Josselyn, at one time president of the Portland Railway, Light & Power Company, now the Portland Electric Power Company, Portland, Ore., died suddenly May 21, 1925, at the age of 67. His early career was devoted to railroad service, and during that period he was associated with the Kansas City, Osceola & Southern Railway, the Omaha & St. Louis, the Omaha & Kansas City & Eastern line, the Kentucky & Indiana Bridge & Railway Company, Louisville, Ky., the Hudson Valley Railway Company, Glens Falls, N. Y., and the Union Terminal Railway Company, Sioux City, Iowa, becoming vice-president of the latter in 1906. Following this, he was vice-president and general manager of the Maryland Telephone & Telegraph Company and of the Baltimore Electric Power Company. In 1907 he went to Portland as president of the Portland Railway, Light & Power Company, on the death of its former president, H. W. Good, and remained in that position until his resignation in 1913 to take up the occupation of Christian Science practitioner.

Dr. A. F. Graf, member of the medical staff of the Southern California Edison Company, Los Angeles, died suddenly at his home, May 4. Dr. Graf joined the Edison company in 1918 after a long service in the United States Navy.

TRADE NOTES

General Electric Company, Schenectady, N. Y., recently has issued bulletin No. 47495.1, which contains much descriptive and illustrated data concerning its types of oil circuit breakers.

Charles Cory & Son., Inc., Chicago, has opened an office at 22 West Quincy Street to serve its increasing clientele for signal, control, communicating and lighting equipment.

The Westinghouse Electric & Manufacturing Company was the recipient recently of orders for feeder voltage regulators totaling over half a million dollars. These orders are for regulators varying in capacity from 11.5 to 888 kva. and in voltage from 2,300 to 13,800. Among those purchasing this equipment are the Los Angeles Gas & Electric Corporation, the Commonwealth Edison Company of Chicago, the Cleveland Electric Illuminating Company, the Commonwealth Power Company of Jackson, Mich., and the Public Service Production Company of New Jersey. The larger units will be used on power circuits.

California Wire & Cable Company, with general offices at Orange, Calif., recently has opened San Francisco offices at 404 Chancery Building, where it will handle the business for northern California, Oregon and Washington, carrying a large stock of weatherproof wire in all sizes.

Wellington Electric Company, Wellington, Colo., has been established recently by Warner & Sons, as a result of the increasing business in the oil fields of northern Colorado. The firm recently was awarded a contract for the wiring of a large parochial school in Fort Collins, Colo.

Industrial Works, Bay City, Mich, recently has announced a new and greatly improved 10-ton crawling tractor crane, known as its type DC. It is claimed that while its appearance is very similar to former types of tractor cranes its design embodies a host of new engineering features, such as split gears for propelling increased speeds, double-clutch mechanism, unusually long tractor belts and independent functions, which it is claimed make that machine the simplest and most economical to operate.

Sundh Electric Company, Inc., Newark, N. J., recently has issued a new bulletin featuring its automatic a.c. starters. The bulletin is illustrated with drawings and diagrams and describes the device in detail and gives price list.

Service Electric Company, Brigham City, Utah, recently has been established by S. Martin Rasmussen and D. L. Peterson. The firm will carry a complete stock of electrical fixtures and appliances and also will engage in house wiring and electrical repair work.

Pacific Electric Clock Company, San Francisco, now is constructing a $30,000 factory at Ninth and Parker Streets, West Berkeley, where it will specialize in the manufacture of school clock systems. J. J. Estabrook heads the concern as president.

The Lincoln Electric Company, Cleveland, Ohio, recently has perfected an automatic welder for use in the manufacture of storage tanks, which it is claimed cuts production costs in half. It is built for such jobs as arc welding of locomotive frames, cross-head guides, welding on truck sides, main driving wheels, journal boxes, brake levers and coupler shanks. The machine is provided with waterproof covers; a push-button starter, tool box handy but out of the way, spring-controlled handle, convenient cable hooks and light total weight are some of the other features.

Century Electric Company, St. Louis, has issued recently a leaflet describing its Century wool yarn system of lubrication for small motors. The booklet is illustrated with photographs and describes in detail the advantages of this new system.

Automatic Electric Heater Company, Warren, Pa., recently has placed on the market a new electric pressure regulator which is designed especially for use with domestic coal or oil-burning furnaces.

Circle F Manufacturing Company, Trenton, N. J., has acquired recently the business of Machen Electric Manufacturing Company of Philadelphia, moving the latter's plant to Trenton. Through this combination it will add a line of flush switches of both the push-button and toggle type, thus giving the company a complete line of electrical wiring supplies.

Locke Insulator Corporation, Baltimore, has announced a new design of insulator which it is claimed has many new mertorious features and improvements over the former type.

Youngstown Sheet & Tube Company, Youngstown, Ohio, recently has issued a new illustrated bulletin containing descriptions and prices of its electrical conduit.

Listenwalter & Gough, formerly of 940 Mission Street, now are established in their new quarters at 325 Fifth Street, San Francisco.

Batcheller & Kneen, Inc., consulting engineering firm, has announced the opening of offices at 929 Dexter Horton Building, Seattle. The experience of the firm has been gained in public utility work, financial surveys and industrial projects in California, Alaska and British Columbia.

Moe-Bridges Company, Milwaukee, has taken over the distribution of Aglites made by the Edwin F. Guth Company, St. Louis. The company states it is well equipped with a large stock to handle any orders from its San Francisco office.

The Johnson Washer Company, Oakland, Calif., established in 1902, has just completed a reorganization in which the capital stock has been increased from $75,000 to $500,000. The business of the company has increased considerably in recent years and it is planning on entering new territory.

The Northwestern Electric Company, Portland, has been appointed representative of the Electro-Kold Corporation, Spokane, to handle the sale in Portland of the electric home refrigerator made by that company. This appliance will be sold through the merchandising department of the company which is under the direction of J. C. Plankinton, sales manager.

Hart Parr Company, Charles City, Iowa, recently has placed on the market a new vacuum washer which serves the double purpose of washing clothes and aiding the housewife in canning fruit in season, it is claimed. The tub can hold a day's canning at one time and so eliminates the inconvenience common to cold packing, according to the manufacturer.

A real catch taken from Big Bear Lake and surrounding streams. Reading from left to right: Harvey Tadlock, building contractor and cook; Dan Jones and Paul Cushing, also building contractors, and D. L. Davis, Ontario electragist.